NOMAD 3

GETTING STARTED GUIDE

Carbide 3D

Table of Contents

Welcome and Congratulations

You are now the proud owner of a Nomad 3, an incredibly powerful and easy-to-use CNC machine. In this guide we will walk you through everything you need to know to get started using your Nomad 3.

PRO TIP: We're here to help! If you encounter any issues setting up your Nomad 3, contact our Tech Support Team at: **support@carbide3d.com** and we'll help get you on track!

Sign Up for an Onboarding Session

For those of you who are new to CNC machining, we recommend signing up for a short onboarding session. The onboarding session will help you get started on your CNC journey. During the one-on-one session you can:

- Ask any questions you encounter as you go through this guide.
- Get step-by-step help walking through the Nomad 3 Starter Project, Step 7 in this guide.
- Ask specific questions about how to begin machining your dream project. How do I start engraving metal? Which end mills can I use? Can I cut steel/brass/copper/acrylic/HDPE? (We'll actually touch on all of these in this guide, though you may have additional questions for our support team during your onboarding session.)

Warranty

Visit our warranty site for Nomad 3 warranty details.

Glossary of Terms

As you're following the setup process in this guide, you may run into CNC terminology you're unfamiliar with. Consult the Glossary of Terms at the end of this document for common CNC terms and definitions.

Important Call-Outs Used in This Guide

Throughout the guide, you will find information that we've called out for you to pay particular attention to. We use three types of call-outs: Warnings, Notes, and Pro Tips:

WARNING: This is a warning. Information in these boxes is **VERY** important. Pay close attention.

NOTE: This is a note—information that points out critical steps or information for future reference.

PRO TIP: This is a Pro Tip. Anytime you see one of these, you will find helpful additional information.

Important Safety Instructions

Nomad 3 is a serious machine that should be treated like any other power tool. Always follow safe-machining practices:

- Always wear safety glasses when your Nomad 3 is on.
- Always wear appropriate hearing protection. Hearing damage is cumulative and irreversible, so it is important to always err on the side of caution.
- Always keep the protective door closed while your Nomad 3 is machining.
- Never leave your Nomad 3 unattended while it is machining.
- Never reach into the machine while it is running.
- End mills are sharp and should be handled with care.
- Always ensure the end mill is securely held by the collet before machining.
- Always use common sense.

In the event that you need to stop the machine right away, press the Power Switch to turn off the Nomad 3.

Additional Safety Recommendations

- Consider the possibility of a fire caused by friction from the spindle and take suitable fire prevention precautions (e.g. having a fire extinguisher handy and other suitable precautions).
- Plug Nomad 3 into an outlet that has a dedicated on/off switch. Be sure this is accessible while the machine is running, in case you should need to shut the machine off immediately.
- Recycle or safely dispose of milling debris and dust, keeping in mind flammability, (potential) spontaneous combustion, and chemical considerations. Even natural materials can have surprising disposal implications. For example, walnut wood dust is allelopathic (it inhibits plant growth), an irritant to the skin and respiratory tract, and potentially poisonous to some animals. All of these possible disposal implications are in addition to the spontaneous combustion hazard posed by all types of sawdust.

Nomad 3 Interlock and Enclosure

Nomad 3 has an interlock. When the spindle is running, opening the door will trigger the interlock which causes the project to pause, and the spindle to pause and move up to a parked position. When the interlock is triggered, Carbide Motion will display the pause screen. Once the door is closed again, you'll need to click the **Resume button** on the pause screen to continue the job.

The enclosure and protective acrylic door are there for two reasons: to contain the mess and to protect you from broken cutters and flying stock.

- End mills, or cutters, are made of carbide, a very hard, very brittle metal. When they break, they snap suddenly and without warning. The window will help protect you from any broken cutters.
- Stock material can break away during cutting. This can happen because you failed to use enough double-sided tape, because the material didn't adhere well enough using that tape, or because you were cutting too fast.

If either of these happens during a job, power the machine down (hit the emergency-stop if one is available on your setup) and fix the problem.

In summary, always close the door when the Nomad 3 is machining.

> **NOTE:** We also strongly recommend keeping the door closed when the machine is not in use. Leaving the door open for long periods of time could weaken the door hinge.

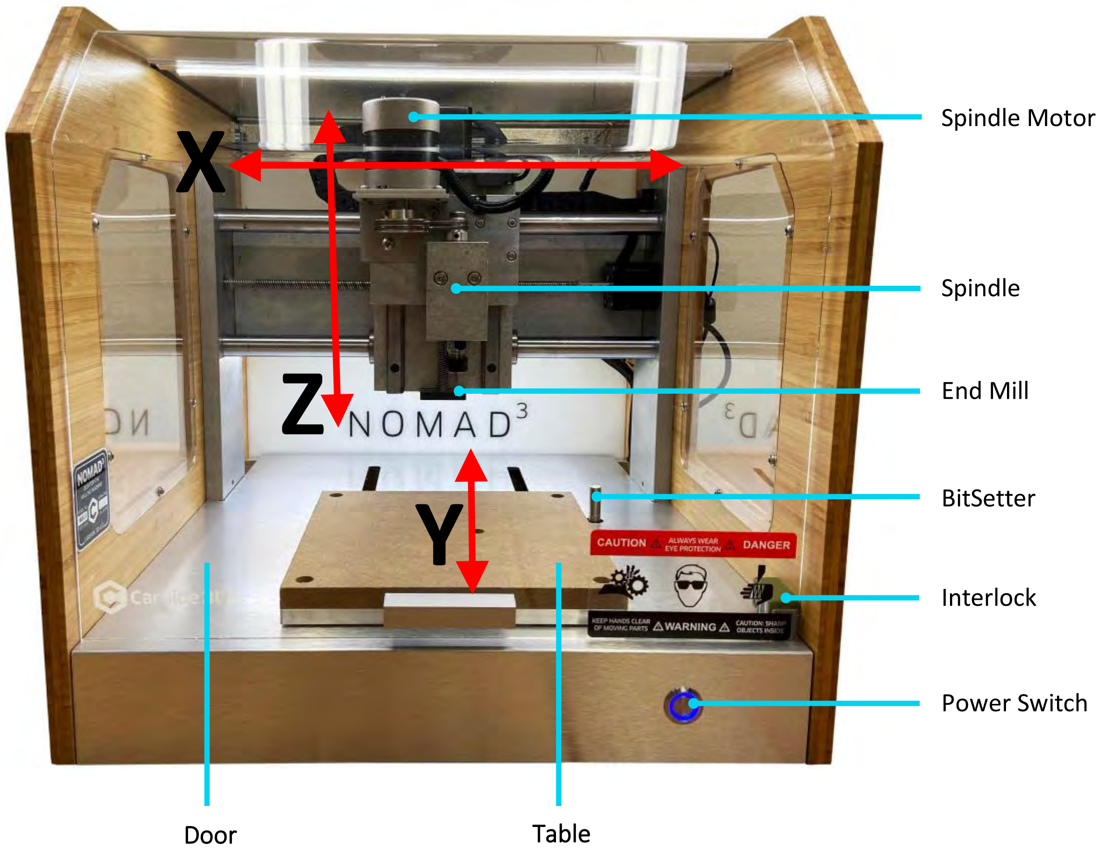
Door Error Messages

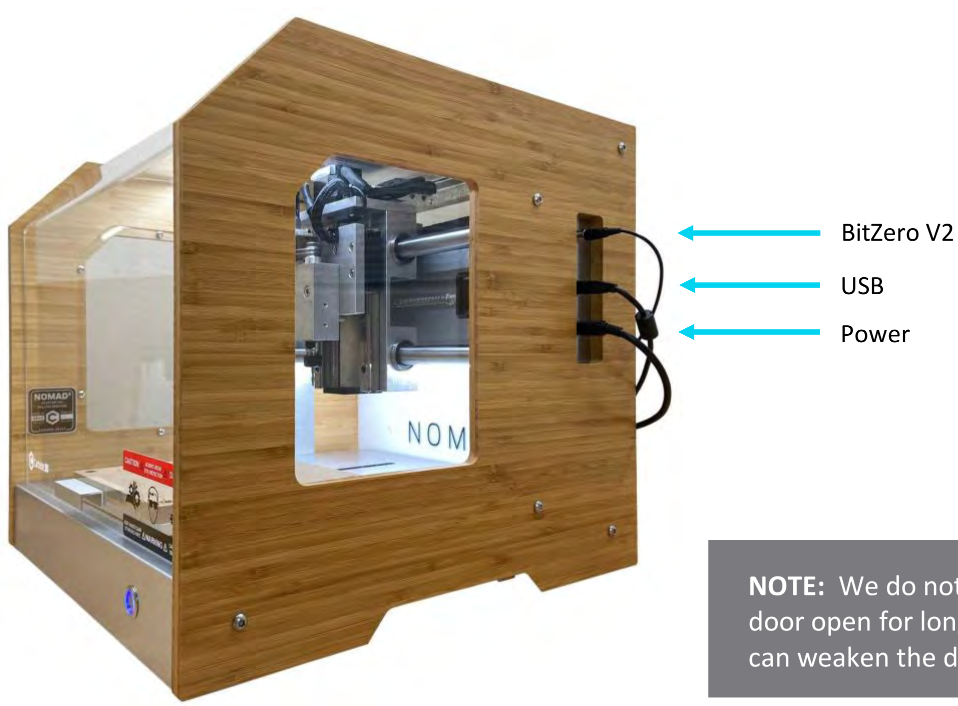
When the door is not fully closed, it cannot disengage the interlock. If this happens, Carbide Motion will prompt you to check the door. If you see a "Please close machine door" or "Machine not idle" message, or if the screen says "BUSY" for a long period of time, make sure the door is appropriately closed.

Interlock Key

The interlock key is provided to allow you to set job zero while the door is open (using the BitZero V2). Place the key on the face of the interlock and the interlock will disengage. **Do NOT use the key to override the interlock while machining. Always close the door while the spindle is on.**

Parts of Nomad 3



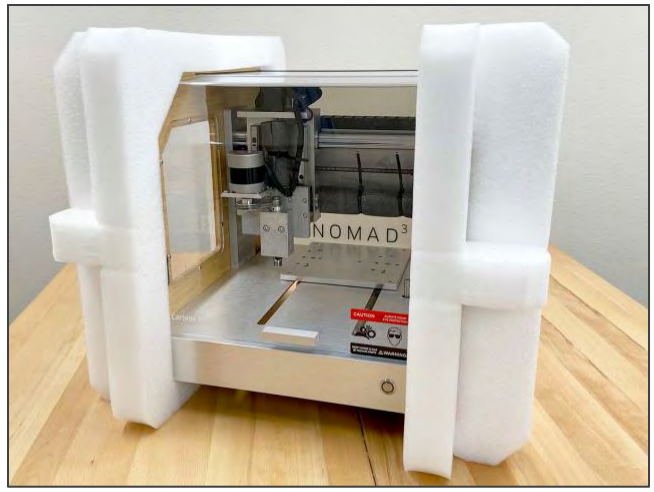


NOTE: We do not recommend leaving the door open for long periods of time, as this can weaken the door hinge.

Step 1: Unpack Nomad 3 Box

Unbox Your Nomad 3

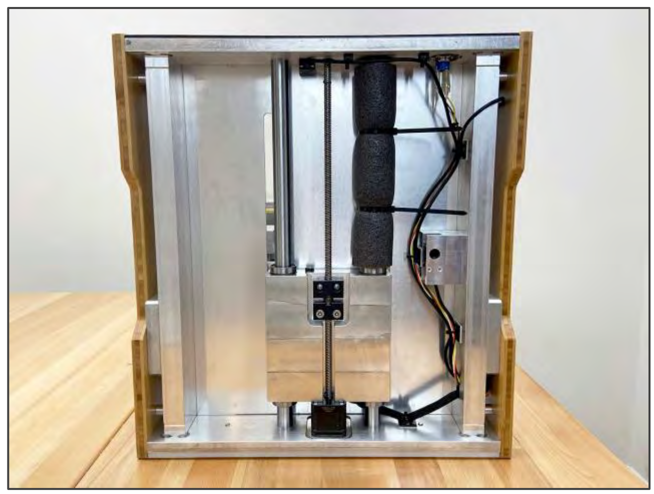
Let's begin by making sure that everything is accounted for and free from any shipping damage. Open the Nomad 3 box by cutting the tape across the top seam. Take precautions to preserve the box while opening; if your machine needs to be moved or shipped, the box is the only way to ensure safe transport of the machine.



1. Once the shipping box is open, you'll find a box that contains the accessories and another that contains the BitZero V2 (touch probe). Remove both items from the main box.
2. The machine weighs approximately 70 lbs. With two people, reach into the box and from the bottom lift the machine up and out of the box onto a table.

> **NOTE:** It is important the entire machine fits on the table and that the table is sturdy.

3. Remove the two foam panels from the outside of the machine and place them back into the box for future transport.



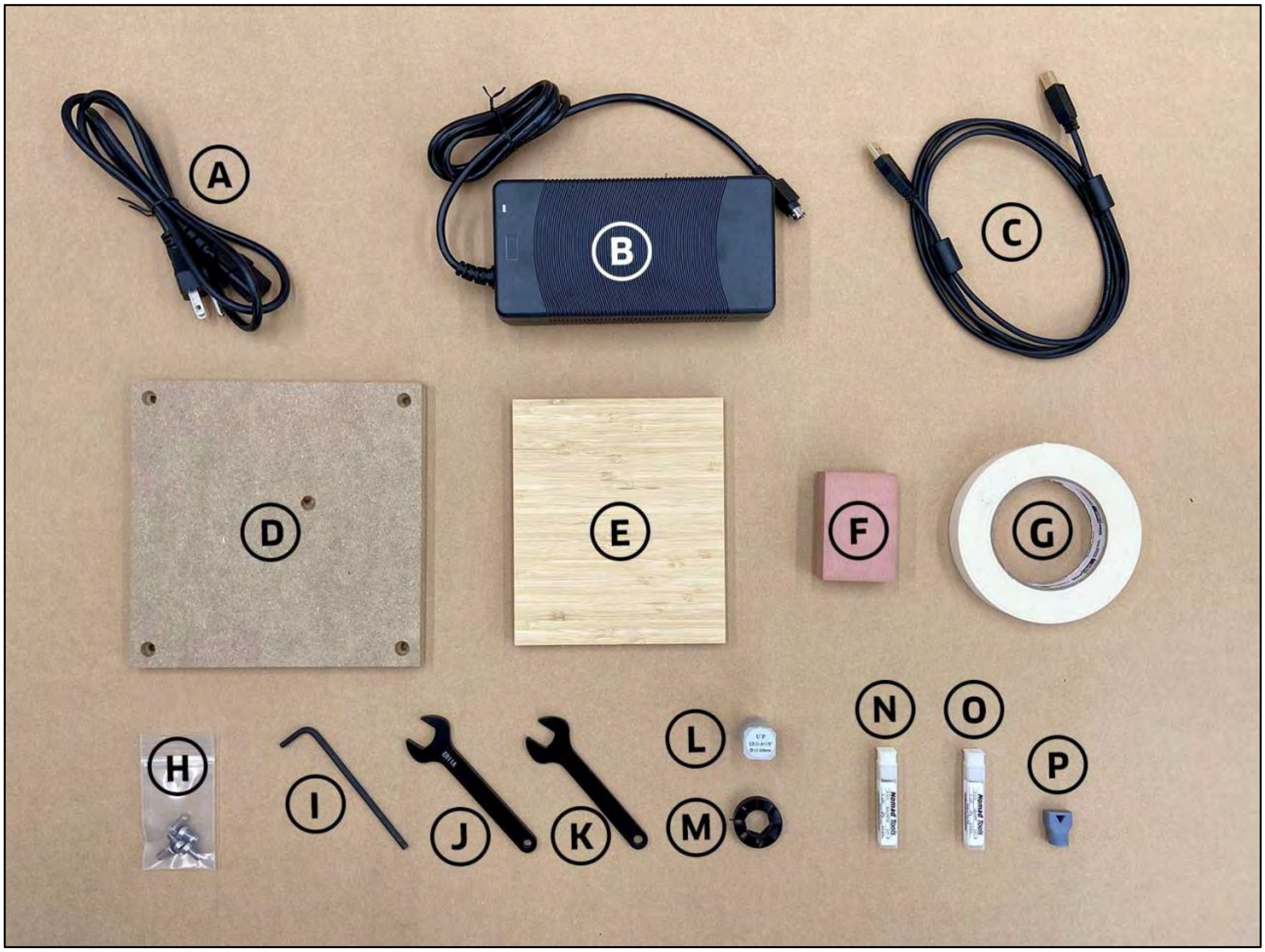
Remove Foam Padding

1. Tilt the machine onto its back or side so you can access the undercarriage.
2. Clip the zip ties that are holding the foam padding to the Y-Axis rail on the underside of the machine. Be careful not to ding the Y-rail.
3. Remove the foam padding and put it in the main box for future transport.
4. Return the machine to its upright position and open the acrylic door.
5. Remove the foam padding from the X- and Z-Axis. Use caution not to ding the rails while clipping the zip ties.
6. Place all foam padding into the main box for future transport.

PRO TIP: Your Nomad 3 kit was carefully packaged by hand. If, after completing your inventory, you find that something is missing or damaged, contact us at **support@carbide3d.com** and we'll ship it to you ASAP.

Open the Nomad Accessory Kit

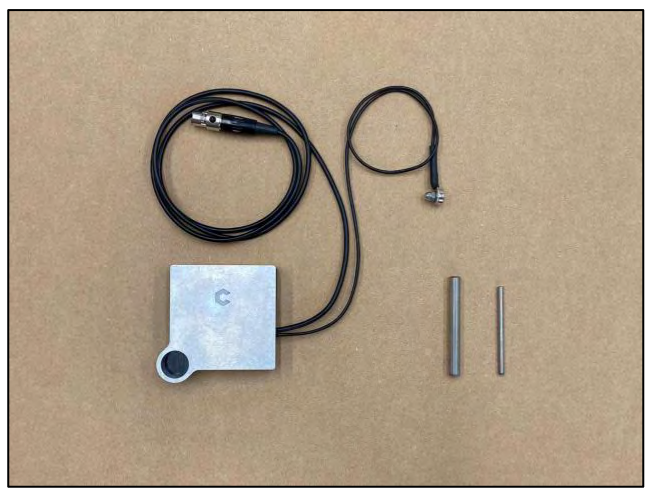
Open the accessory box and inspect its contents. This box should contain all of the items shown in the image below and listed in the table on the next page.



Item	Description	Qty
A	Power Cord	1
B	Power Supply	1
C	USB Cable	1
D	8″ × 8″ × ½″ MDF Wasteboard	1
E	6″ × 7″ × ½″ Bamboo Plywood	1
F	2″ × 3″ × 1″ Renshape	1
G	Double-Sided Tape	1
H	Wasteboard Hardware: M6 × 10mm SHCS	4
I	4mm Hex Key	1
J	17mm Collet Wrench	1
K	13mm Shaft Wrench	1
L	⅛″ Collet and Nut	1
M	Chip Fan	1
N	#101 ⅛″ Ballnose End Mill	1
O	#102 ⅛″ Square End Mill	1
P	Interlock Key	1

Open the BitZero V2 Box

This box contains the BitZero V2 and two probing pins.



Step 2: Download and Install Software

Carbide Motion

Carbide Motion is the machine control software for your Nomad 3 CNC machine. Carbide Motion lets you control your machine by jogging it around, setting zeroes, and loading and running G-code. You'll need to install this software in order to operate the machine. Download and install the latest version of Carbide Motion:

1. Download Carbide Motion (Windows and Mac OS X available).
2. Once the download completes, double-click the file and follow the instructions to install the software to your computer.
3. After Carbide Motion installs, it is a good idea to drag the icon onto your Windows Taskbar (or Dock on a Mac) so you can easily access the program.

Check out the Carbide Motion User Guide on the Carbide 3D docs site.

MeshCAM

MeshCAM is 3D CAM software that can convert 3D models such as STL files, into G-code for your Nomad 3. MeshCAM saves a proprietary G-code for Nomad machines, so no additional license code is required to use it with Nomad 3, but it will not generate G-code for other CNC machines. Download and install the latest version of MeshCAM:

1. Download MeshCAM (Windows and Mac OS X available). You'll need to download V7 or later. We recommend using the latest version, MeshCAM V8.
2. Once the download completes, double-click the file and follow the instructions to install the software.
3. After MeshCAM installs, drag the icon onto your Windows Taskbar (or Dock on a Mac).

Carbide Create

Carbide Create is a cross-platform 2D CAD/CAM software package made by Carbide 3D. This software is ideal for designing 2D and 2.5D parts, has built in 3D previews and works flawlessly with your machine. You'll use Carbide Create to create 2D and 2.5D designs, generate toolpaths, and export G-code which you will run in Carbide Motion to machine your part. Download and install the latest version of Carbide Create:

1. Download Carbide Create (Windows and Mac OS X available).
2. Once the download completes, double-click the file and follow the instructions to install the software.
3. After Carbide Create installs, drag the icon onto your Windows Taskbar (or Dock on a Mac).

Check out the Carbide Create Video Tutorial Series on the Carbide 3D docs site.

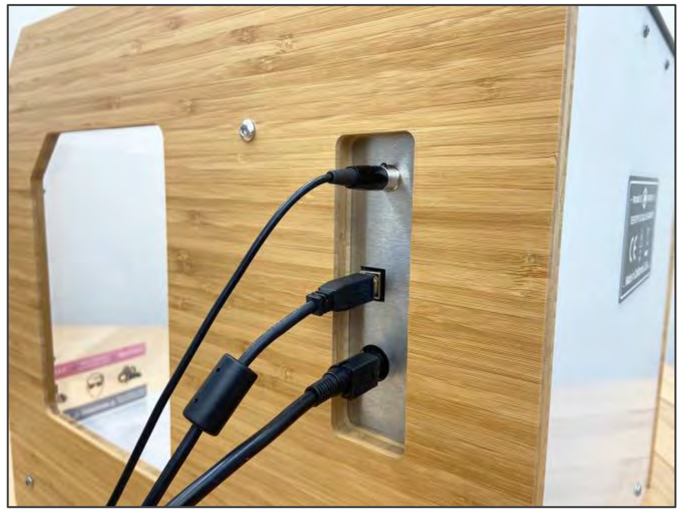
Alibre Workshop

Alibre Workshop is a 3D CAD/CAM program. With Alibre Workshop, you can design from scratch, import 2D and 3D formats, or create toolpaths from images. You will receive a license and download link for Alibre Workshop directly from Carbide 3D.

Step 3: Connect and Home Nomad 3

Plug in the Cables

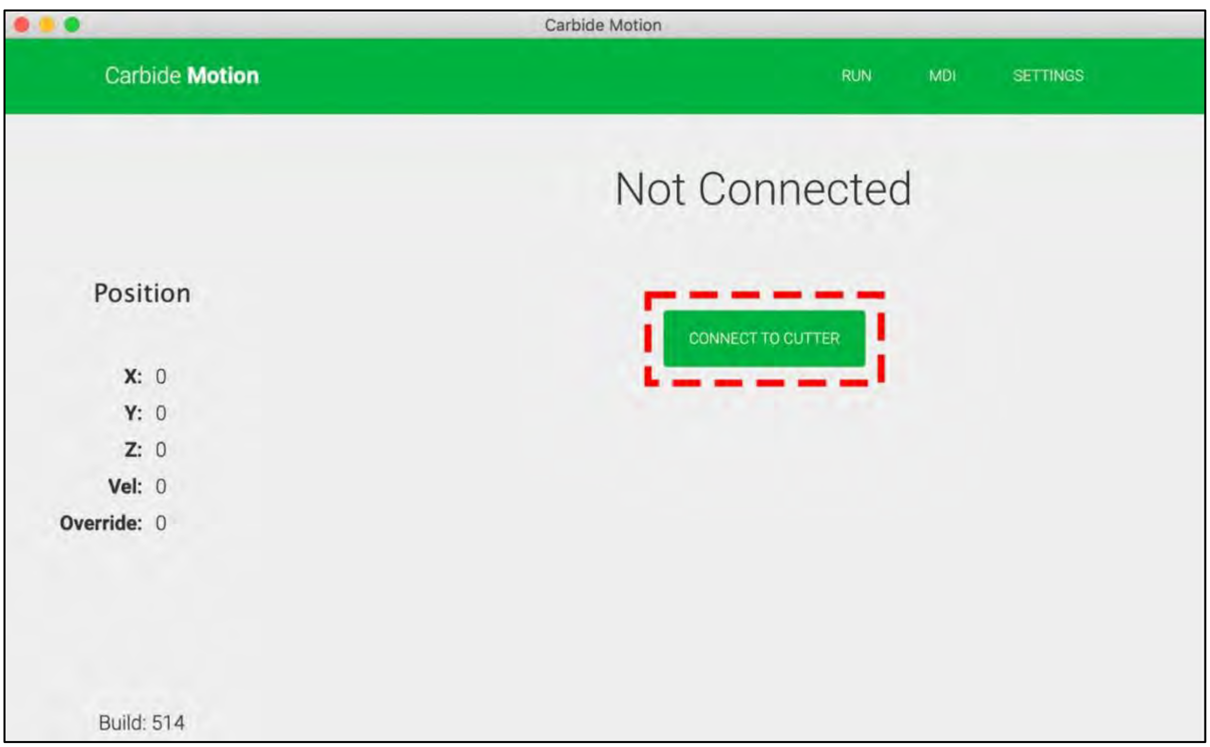
1. Plug the power cable into the bottom connector on the outside of the machine enclosure. The flat side of the power connector faces right (toward the rear of the machine).
2. Plug the USB cable into the middle connector. The small end of the cable plugs into the connector. The larger USB end will plug into a USB port your computer.
3. Plug the BitZero V2 into the top connector with the small black release button facing up.



Connect to Nomad 3

Nomad 3 is controlled by Carbide Motion. To connect your machine to Carbide Motion:

1. Power up your computer.
2. Connect the USB cable to your computer.
3. Start Carbide Motion on your computer.
4. Press the Power switch on the front of Nomad 3 to power it on.
5. In Carbide Motion, click the **Connect to Cutter button**.

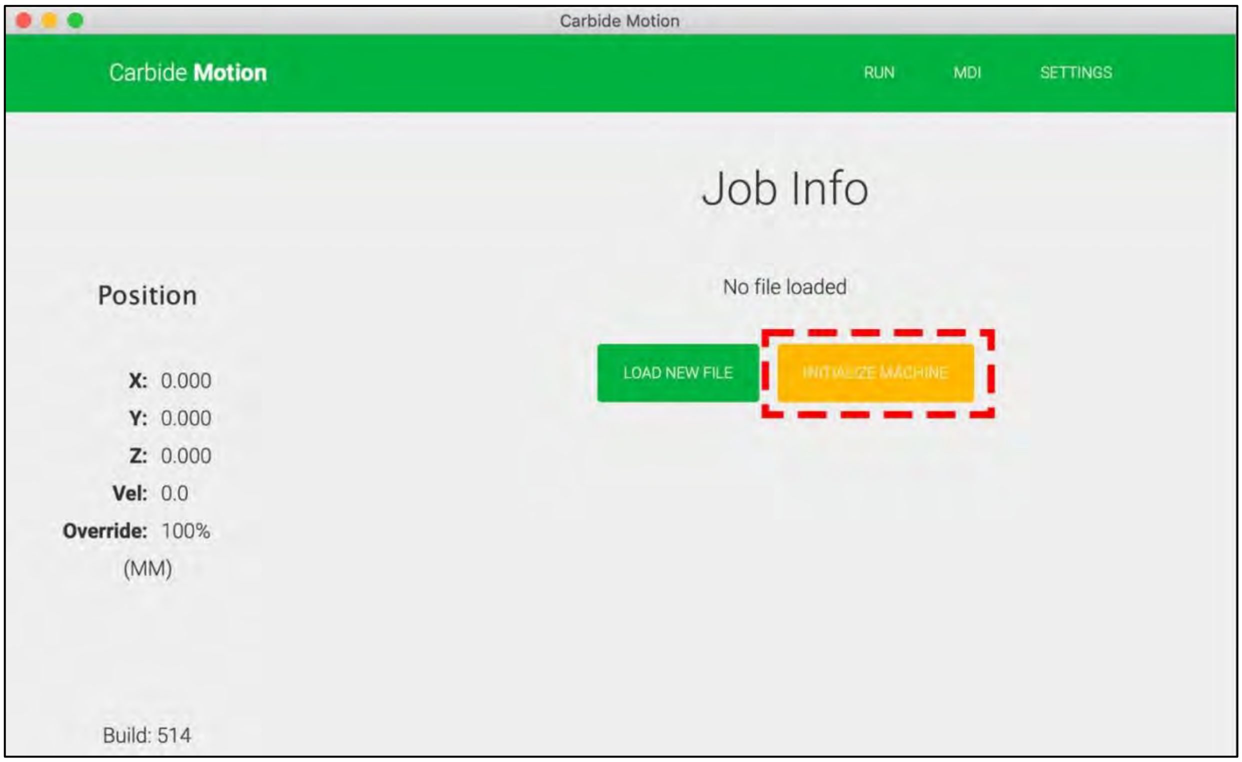


Home Your Nomad 3

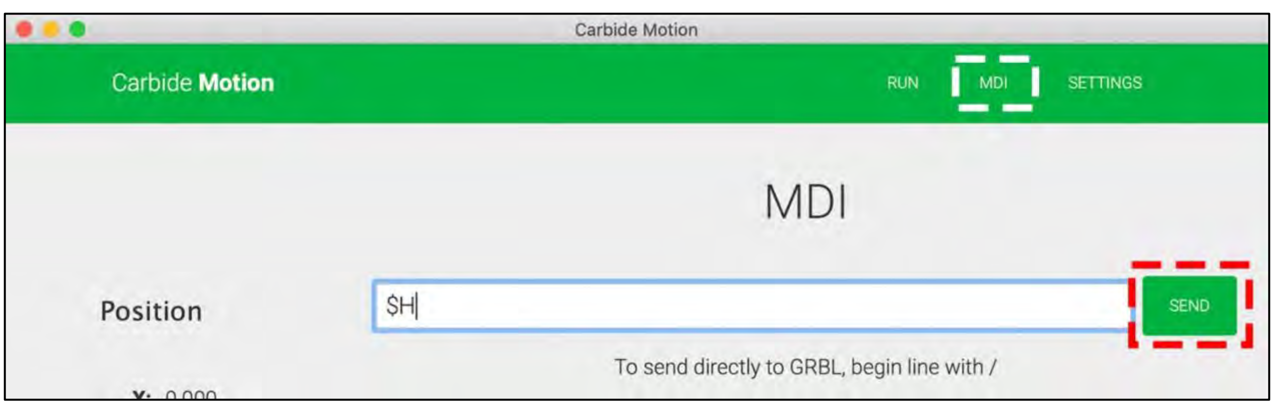
Now that you are connected to your Nomad 3, it's time to home it. Homing your CNC machine is the process of sending it to a known, fixed, repeatable location. This means that every time you home the machine, it will move to EXACTLY the same position. Every. Single. Time. This allows you to move your machine to ANOTHER position, relative to the home position, with great precision. On your Nomad 3, the home is position is the back-right corner.

To home your Nomad 3:

1. Click the **Initialize Machine button**. When homing is complete, your spindle will be in the back-right corner and the table will be at the front of the machine.



PRO TIP: Sometimes, later on in a project you will want to home the machine again. To do so, click **MDI** in the top menu bar to open the *MDI screen*. Enter **$H** into the text field and click the **Send button**. This will re-home the machine.

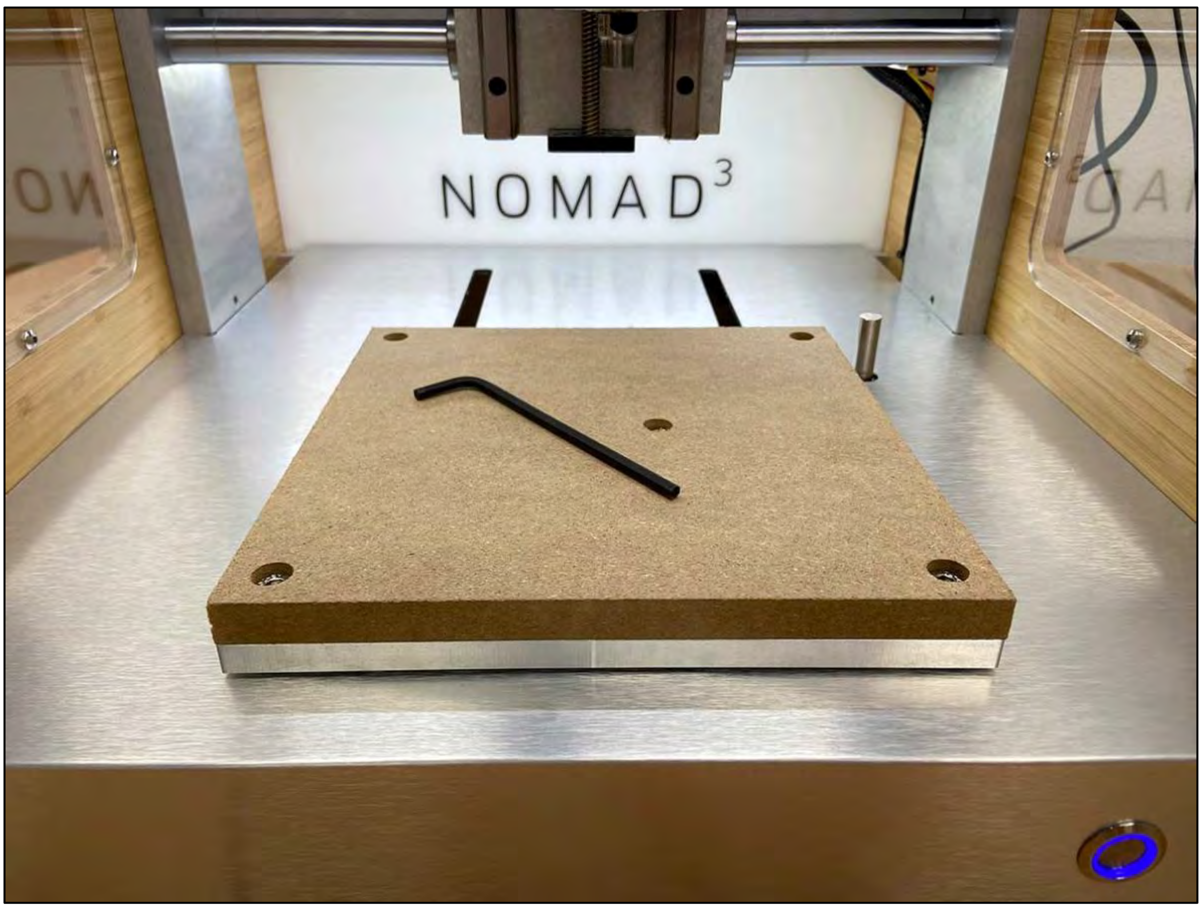


Step 4: Install the Wasteboard

Now that the homing sequence has moved the table to the front of the machine, it's time to install the wasteboard. The wasteboard protects the machine's aluminum table from damage. While you can attach stock material directly to the table, chances are high that you'll accidently cut through the material and into the table at some point, so we highly recommend using the wasteboard.

To install the wasteboard:

1. Remove the wasteboard, M6 × 10mm SHCS, and 4mm hex key from the accessory box.
2. Place the wasteboard on the table with the countersunk holes facing up, and the middle-countersunk hole positioned just right of center.
3. Line up the countersunk holes with the holes in the table.
4. Use the 4mm hex key and the five (5) M6 × 10mm screws to secure the wasteboard. While tightening, ensure your MDF wasteboard stays square with the aluminum table.

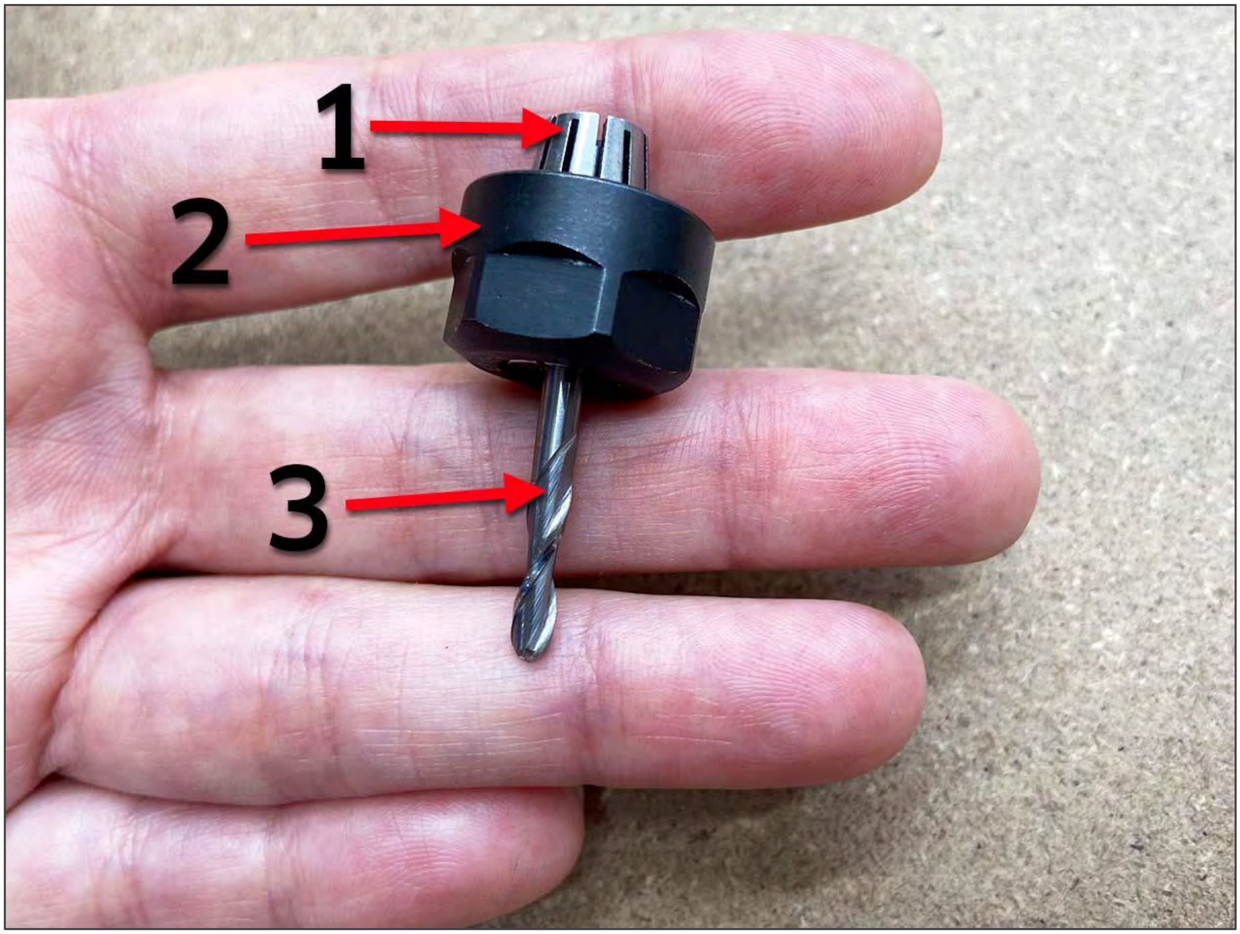


Step 5: Install the Collet and Nut

What Is a Collet?

A collet is used to secure an end mill in the spindle. A collet is sized to hold one diameter of cutter. Your Nomad 3 comes with a ⅛″ ER-11 collet which is capable of holding any ⅛″ diameter cutter, even if you did not buy it from Carbide 3D. You can buy additional ER-11 collets to hold different diameter cutters from Carbide 3D or other vendors.

The collet (1) holds the end mill (3) when the collet nut (2) is tightened in a spindle.

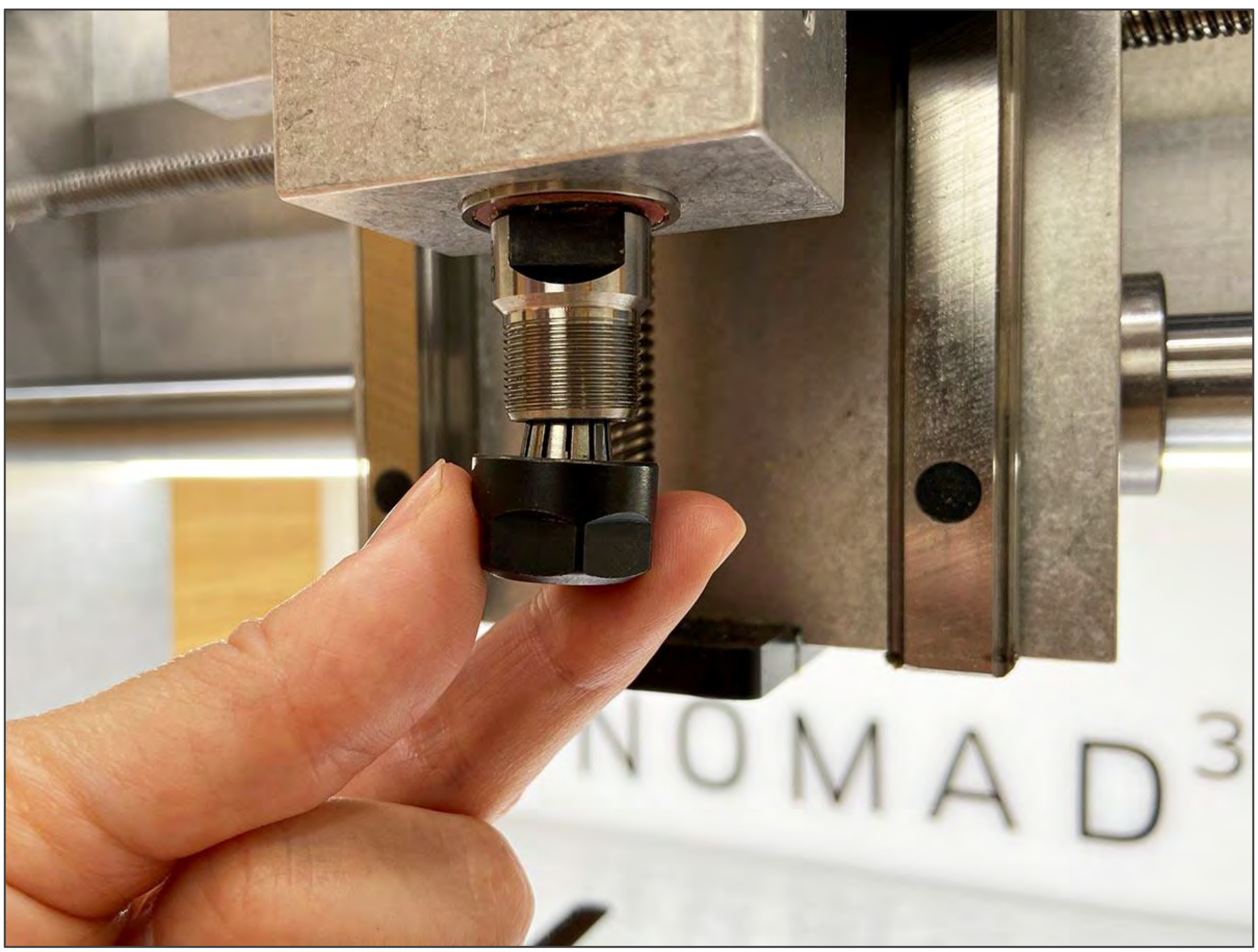


How to Install the Collet and Nut

To install the collet and nut:

1. Snap the collet into the collet nut:
    a. Set the collet nut on the table with the threads facing up.
    b. Use your thumb to press the collet into the nut until you hear a "click." Once the collet is clicked into the nut it is secured in place.
2. Insert the collet into the shaft of the spindle and loosely thread the nut onto the spindle shaft. Do not use the collet wrenches to tighten the collet nut at this time.

WARNING: Never fully tighten the collet nut without first inserting a tool or the collet could break.



Step 6: Install a Probing Pin

After connecting and homing the machine, you will be prompted to insert a tool. At this time, you can either install a probing pin (to use the BitZero V2 to find job zero) or you can install an end mill. Typically, you will install an end mill only after finding job zero.

To get ready to find job zero in the first project, the Nomad 3 Starter Project, you'll need to install the probing pin:

1. Insert the ⅛″ probing pin, included in the BitZero V2 kit, into the loose collet a minimum of 0.75″ (20mm) — the entire length of the collet and nut.
2. Hold the shaft of the spindle (above the threads) with one hand, while holding the probing pin in position and tightening the collet nut with your other hand.

WARNING: You can damage a collet if you compress it without support from the inside. This is also why you should never tighten the collet nut without first inserting a tool, as you can damage the collet.

3. Tighten the collet nut with your fingers, just until the probing pin will not fall out.
4. Use the 13mm shaft wrench to hold the shaft of the spindle in place, while using the 17mm collet wrench to tighten the collet nut and secure the probing pin.
5. In Carbide Motion, hit the **Resume button**. The spindle will position above the BitSetter and will automatically measure the length of the probing pin.

NOTE: BitSetter is an automatic tool offset probe, which measures the length of each tool. BitSetter makes it easy to run jobs using multiple tools without the need to stop and re-zero your Z-Axis manually. This makes tool changes with the Nomad 3 simple and straight forward.

Step 7: Run the Starter Project

Congratulations! Your Nomad 3 is now set up and you are ready to run your first project. The Nomad 3 Starter Project on the Carbide 3D website will walk you through the steps to create a tool organizer tray which can hold all of your Nomad 3 accessories, such as end mills, ER-11 collets, and wrenches. The tutorial uses the 6″ × 7″ × ½″ piece of bamboo plywood included in your Nomad 3 kit. Everything you need to know is covered in the tutorial, including:

- How to create toolpaths in Carbide Create.
- How to export G-code (the code that tells your Nomad 3 how to machine the part).
- How to secure the bamboo plywood to your wasteboard.
- How to install an end mill.
- How to use BitZero V2 to set job zero for the project.
- How to import G-code into Carbide Motion to begin machining.

Next Steps

Frequently Asked Questions

On the following pages, you'll find detailed answers to Nomad 3 frequently asked questions:

Additional Information

Finally, at the end of the document, you will find:

Which End Mills Can I Use?

Nomad 3 uses a spindle with an ER-11 collet system. The machine ships with a ⅛″ collet and nut, which allows you to use any end mill, also known as a cutter, that has an ⅛″ diameter shank. The shank diameter determines what size collet should be used to hold the cutter in the spindle.

Where Can I Purchase Additional End Mills?

Browse through the end mills on our Cutters page in the Carbide 3D store. Our #100 series and our #501 and #502 cutters are all ⅛″ end mills.

Nomad End Mill Starter Pack

If you're not quite sure which endmills you should get to start working on those projects you've got lined up for your Nomad 3, the Nomad End Mill Starter Pack is a great choice! This starter pack has a collection of the most popular endmills to get you milling in no time. All end mills in the kit fit the ⅛″ collet and nut that comes with your Nomad 3. Each Nomad Cutter Starter Pack contains the following:

- 2 ea - #101 .125″ Ball Endmill
- 2 ea - #102 .125″ Flat Endmill
- 2 ea - #111 .0625″ Ball Endmill
- 2 ea - #112 .0625″ Flat Endmill
- 1 ea - #121 .0312″ Ball Endmill
- 1 ea - #122 .0312″ Flat Cutter
- 1 ea - #501 60° PCB Engraver
- 1 ea - #502 40° PCB Engraver

Which End Mills Can I Use for Engraving?

If want to do engraving on metal or very fine lettering or detail work, check out our engraving end mills: #501 - 60° Tip Engraver and #502 - 40° Tip Engraver (both have a ⅛″ shank). What's the difference between the two? A smaller angle tip means a smaller cutting width, and therefore, finer engraving.

You may also be interested in our Amana AMS-114-K 3 Piece CNC Signmaking and Engraving Pack, it includes a ¼″ 2-flute spiral down-cut cutter, a ¼″ 2-flute compression cutter, and a 30° engraver. This kit requires a ¼″ collet.

What if I Want to Use Larger End Mills?

Because the spindle uses the ER-11 collet system, if you'd like to use a larger tool with your Nomad 3, you can purchase a **¼″ ER-11 Collet and Nut**. This will allow you to use cutters with ¼″ shank for use in appropriate materials. The kit includes an extra collet nut so you can quickly switch between collets without having to remove them from the collet nut. The maximum end mill diameter that you can use with your Nomad 3 is 7mm (0.275″); make sure to purchase an appropriately sized collet.

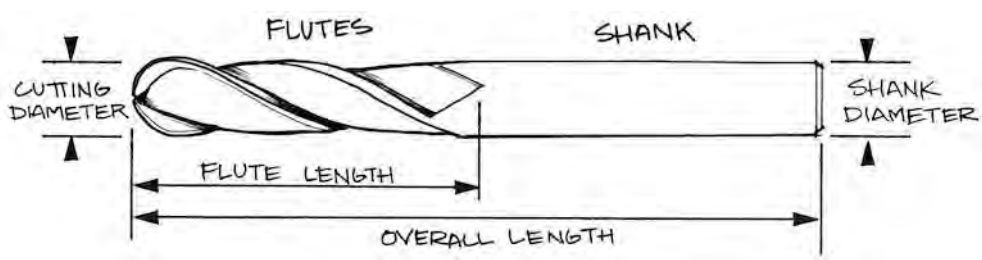
NOTE: The Nomad 3 does not use a proprietary system for end mills. That means that any end mill, from any vendor will work. Just make sure you get the correct shank size for your collet.

What if I Want to Use Smaller End Mills?

In the Carbide 3D Shop, we offer several small cutting-diameter end mills: 1⁄16″ (0.0625″), 1⁄32″ (0.0312″), and 2mm single flute (0.078″) end mills. Because they all have a 1⁄8″ shank, they can be used with your 1⁄8″ collet.

You can also purchase smaller ER-11 collets if you decide you want to purchase end mills with shank smaller than 1⁄8″. You just need to make sure that the collet is appropriately sized for the end mill you want to use. For example, you'll need a 1⁄16″ collet for an end mill with a 1⁄16″ shank and a 1⁄32″ collet for an end mill with a 1⁄32″ shank.

What are the Parts of an End Mill?



Shank: The diameter of the non-cutting end of the cutter.

Overall Length (OAL): The total length of the cutter (measured from tip to tip).

Length of Cut (LOC): The total length of the cutting surface of the cutter. If this dimension is less than the dimension of the shank, the LOC is effectively how far down the cutter can plunge (total) into the material.

Flutes: The number of cutting surfaces found on the cutter. For example, a 2-flute cutter has two cutting edges, a 3-flute cutter has three cutting edges.

Cutting Diameter: The diameter of the cutting area of the end mill (can be different from the shank size).

What Are Common End Mill Varieties?

End mills generally come in two varieties: square (right) and ballnose (left) end mills. Watch the How to Pick an End Mill for Your Project Video.

Aside from the shape of the end mill, the tip geometry also varies between types, determining the way the chips are ejected and effecting the smoothness of the finish.

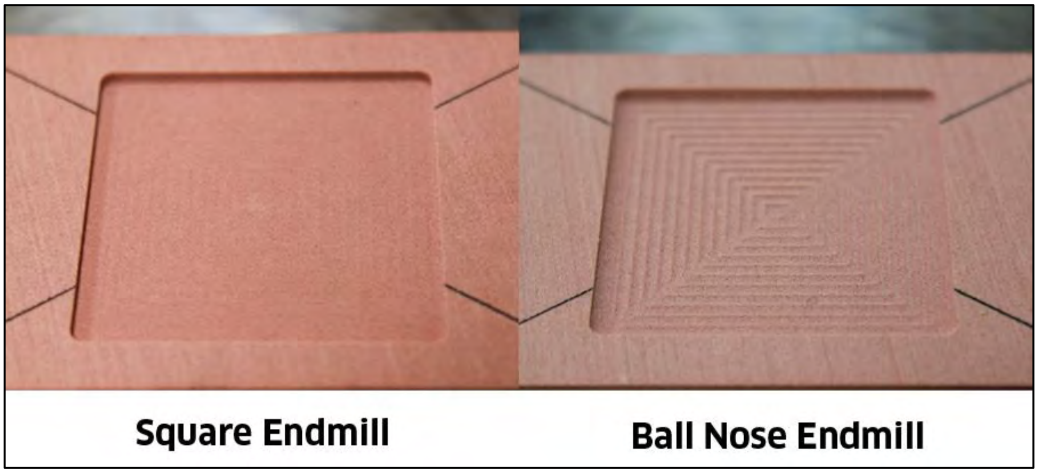
Up-Cut: Up-cut end mills 'pull' the chips UP and out of the slot. These tend to leave a smooth finish on the bottom of the material.

Down-Cut: Down-cut end mills 'push' the chips DOWN into the slot. These tend to leave a smooth finish on the top of the material.

Compression: Compression-cut end mills have a mixture of up-cut and down-cut flutes, creating a smooth finish on the top and bottom of the material.

Square End Mills

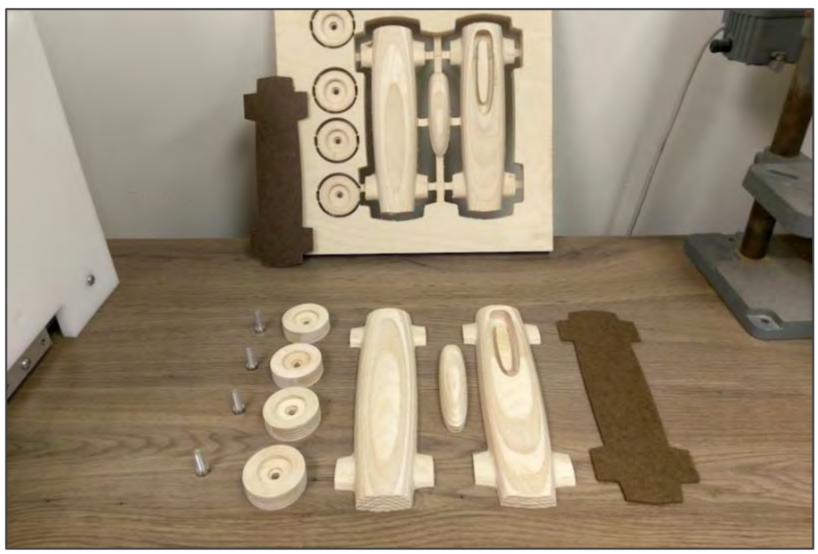
Square end mills cut a smooth flat-bottom surface. They are known for milling 2D and 2.5D parts, where flat bottoms and vertical walls define the design.



Ball Nose Mills

Scallops: Ballnose end mills do not cut a flat bottom surface, instead they will leave scallops.

Contours: Ballnose end mills are known for milling contoured or organic shapes. They do a nice job of getting in the nooks and crannies of contours.



V-Bit End Mills (Engraving)

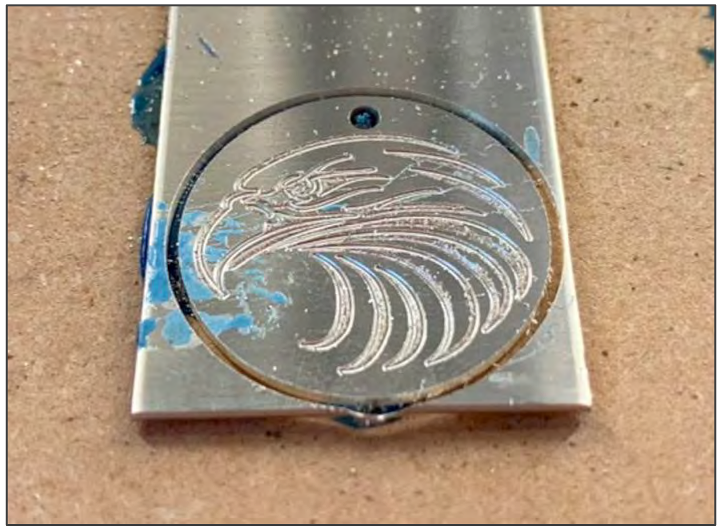
A V-bit is a V-shaped cutter used to create V-carving (engraving) designs. Because of how V-carving toolpaths are generated, you can create very fine *and* very wide details with the same cutter. It is important to know that the flatness of your material will make a difference with the results when using a V-cutter.

PCB Engraving End Mills

PCB engraving bits are designed to take off the very thin layer of copper on raw copper clad boards, along very narrow paths (for example in-between the copper traces of the circuit design). For optimal results they require the material to be very flat, and installed on a very flat surface, such that there is no depth difference between different sides of the PCB.

For more information about end mills, visit our End Mill Wiki.

Which Materials Can the Nomad 3 Cut?



The Nomad 3 cutting area is 8″ (X) × 8″ (Y) × 3″ (Z). Because the Nomad 3 has a rigid frame and 130W DC brushless spindle with a maximum 24k RPM, it's designed to accurately cut in materials up through the hardness of non-ferrous alloys such as brass and even aerospace-grade aluminum. Some examples of materials that are appropriate include:

- Hardwoods, such as maple, ash, basswood, birch, cherry, walnut, poplar, and oak.
- Softwoods, such as pine, cedar, balsa, and fir.
- Plastics, such as ABS, Delrin (Acetal), Polycarbonate (PC), Acrylic (PMMA), Nylon, HDPE, LDPE, PP, PET, and PVC, Polyethylene, and Polyurethanes.
- Synthetics and composites, such as Renshape and other Polyurethane resins with fillers, as well as foams.
- Metals,* such as copper, brass, and aluminum, including 6061 and 7075 alloys for example.

*With the use of coolants, harder metals such as titanium and steel alloys and some stainless-steel alloys have also been machined with the Nomad Pro, our previous Nomad model. The Nomad 3 has a more powerful spindle, so anything that can be machined on Nomad Pro, can definitely be machined on your Nomad 3.

Material Guides

Check out the material guide videos below for tips and sample speeds and feeds for machining various materials on your Nomad Pro. See the *What Are Toolpaths and G-code?* section for information about speeds and feeds.

Plastics

- Thermoplastics (Acetal, Polyoxymethylene, and Delrin)
- Polycarbonate
- Cast Acrylic
- High density polyethylene (HDPE)

Synthetics and Composites

- Renshape
- Machinable wax
- Linoleum

Metals

- Aluminum
- Steel and stainless steel
- Copper
- Brass
- Brass and copper sheets
- Sterling Silver

How Do I Install/Remove an End Mill?

Install an End Mill

After connecting and homing the machine, you will be prompted to insert a tool. At this time, you can either install a probing pin and use the BitZero V2 to find job zero, or you can install an end mill. Typically, you will install an end mill only after finding job zero with a probing pin. Watch our End Mill Installation Tips video for an overview of the process and tips.

To install an end mill:

1. Ensure the selected end mill is free of any debris.
2. Insert the shank of the end mill into the loosened collet a minimum of 0.75" (20mm), the entire length of the collet and nut. The tool should project at least as much as the deepest intended cutting depth but should not extend more than 2" from the collet nut.

WARNING: You can damage a collet if you compress it without support from the inside. This is also why you should never tighten the collet nut without first inserting a tool, as you can damage the collet.

3. Hold the shaft of the spindle (above the threads) with one hand, while holding the end mill in position and tightening the collet nut with your other hand. Be very careful not to cut yourself on the end mill.
4. Lightly tighten the collet nut with your fingers, just until the end mill will not fall out.
5. Now, use the shaft wrench to hold the shaft of the spindle in place, while using the collet wrench to tighten the collet nut and secure the end mill.
6. In Carbide Motion, hit the **Resume button**. The machine will position the spindle above the BitSetter, which will measure the tool length.

NOTE: BitSetter is an automatic tool offset probe, which measures the length of each tool. BitSetter makes it easy to run jobs using multiple tools without the need to stop and re-zero your Z-Axis manually. This makes toolchanges with the Nomad 3 simple and straight forward.

How Tight Should the Collet Be Around the End Mill?

- The collet should be tight enough that the end mill will not work loose during machining (it must be more than hand-tight).
- The collet should never be over-tightened as this can put undue strain on the spindle, nut, and collet, which can damage the end mill over time.

Install the Chip Fan

The included chip fan is designed to blow away the wood chips and dust that accumulate on the work surface during cutting. The chip fan slides onto the exterior of the collet nut from the bottom. The fan blades are designed to create a downdraft during milling and, at the same time, keep the fan in place on the collet nut.

1. Slide the chip fan onto the bottom of the collet nut.

Remove an End Mill?

To remove an end mill:

1. Ensure the spindle has stopped and parked.
2. Remove the chip fan, if necessary.
3. Use the 13mm and 17mm wrenches to loosen the collet nut until the end mill can be removed from the collet.
4. Remove any debris from the end mill and store it in its original plastic packaging or a tool tray.

NOTE: The **Nomad 3 Starter Project** on the Carbide 3D website will walk you step-by-step through creating a tool tray designed to hold multiple end mills, collets, and other tools. The Starter Project uses the 6″ × 7″ bamboo plywood included in your Nomad 3 kit.

How Do I Secure Material to the Nomad 3?

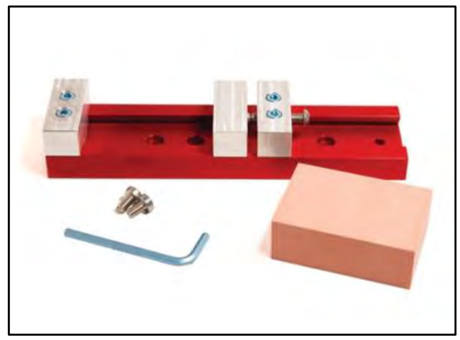
Regardless of what type of project you are making, one of the first things to determine is how you will secure the material to the machine. This concept is called workholding. There are several common ways to hold material down. The specifics of your project, part, material, and other requirements will determine which method you choose. The main objective for workholding is to secure your material to the machine in a way that will not yield to the forces of machining. The most common forms of workholding for the Nomad 3 are:

- Double-sided tape
- Low-profile vise
- Top clamps
- Machinable fixturing wax

PRO TIP: It is good habit to select a workholding option early in a project, so as to have the opportunity to cater to any workholding constraints in the design itself.

Workholding Options in the Carbide 3D Store

Low-Profile Vise



We make this vise from scratch, in-house, specifically for Nomad machines. The vise is 2″ wide × 8″ long. The maximum clamping width is 6.5″. Hardware for attaching it to the table is included.

Watch the Machining Steel and Stainless Steel on the Nomad video to see the low-profile vise in action.

Watch the Nomad Low Profile Vise Installation video.

Purchase

Tiger Claw Clamps

The Tiger Claw Clamp is a low-profile, high-quality stainless-steel clamp that can be used on the Nomad. With over 15mm of lateral travel these beasts will hold your job down with a tight grip, no matter what you’re making. The Tiger Claw Clamps have a secure grip that works great for carving projects since there’s no vertical clamping face.

Tiger clamps come in two sizes, standard and compact. The Tiger Claw Compact clamps are shorter and have a lower profile than the standard Tiger Claw clamps, for those applications where space is at a premium. They are very useful with jigs and fixtures, where there is no need for placement adjustment and where the reduced clamp track (2mm) will be sufficient.

Watch the Tiger Claw Clamps video.

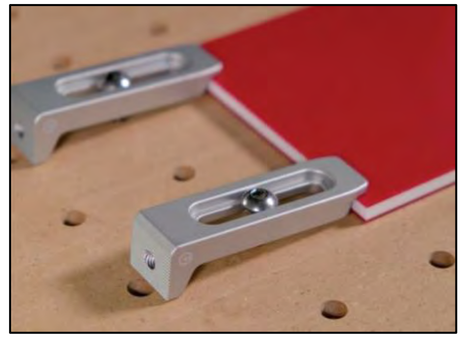
Purchase

Gator Tooth Clamps

Gator Tooth Clamps are ultra-low-profile. Use them as a backstop, a side clamp, or a toe clamp. With over 30mm of lateral travel, these beasts will hold your job down safely and securely. Clamps come in anodized aluminum or stainless steel.

Watch the Gator Tooth Clamp video.

Purchase



Lock Stops

The Lock Stop is a low-profile, high-quality stainless-steel stop that can be used on the Nomad in conjunction with the Tiger Claw (standard or compact) or Gator Tooth Clamps. These lock stops help secure your job with a tight grip and serrated face, no matter what you're making.

Watch the Lock Stop video.

Purchase

Nomad Threaded Table

This is a ½" thick aluminum replacement table for your Nomad 3. It's got over fifty M6 × 1 threaded holes to give you plenty of clamping options. The Threaded Table comes with the table, clamps, and five M6 screws to attach it to your Nomad's aluminum table.

Watch the Using Clamps with the Nomad Threaded Table video.

Purchase

Machinable Fixturing Wax

Machinable fixturing wax is particularly invaluable for holding and machining thin metal such as aluminum and brass. The alternative, double-sided tape, can gum up the cutter. With wax you can easily remove your finished part without prying or bending it. The wax is available in two strengths: higher strength and lower strength (water soluble).

Purchase

Super Hold Kit

The Super Hold is a work-holding solution that provides an easy way to secure thin pieces of stock without the use of clamps.

Similar to using double-sided tape, the Super Hold uses a combination of tape and glue to secure your material by conforming to small irregularities in flatness and peels off cleanly from both the work surface and the material. The accelerator in the kit helps speed up the curing process for those quick jobs!

Watch the Super Hold Kit video.

Purchase

Double-Sided Tape

When you use up the last of the double-sided tape included in your Nomad 3 kit, you can purchase it through the Carbide 3D store. Tape is 0.75″ wide, 5 mil thick, 36 yards long, and it has 66 ounces per inch adhesion.

Purchase

How Do I Set Job Zero?

What Is Job Zero?

At the most basic level, job zero, also called job origin, tells the machine where to begin running the job. Job zero is a point in your design where all of the toolpaths will be based from (the X, Y, and Z coordinates).

In Carbide Create, job zero is called "Toolpath Zero". When you design a project in Carbide Motion, you can choose from several options for the project's origin point:

- Lower-Left
- Center-Left
- Top-Left
- Center

In MeshCAM, job zero is called "Program Zero" and there are even more origin options:

- NW corner (top-left)
- Center-left
- SW corner (bottom-left)
- Center back
- Center
- Center front
- NE corner (top-right)
- Center-right
- SE corner (bottom-right)

The lower-left corner is the most common job zero point for simple, beginner projects. With more advanced projects, it may be beneficial to choose one location over the others; though what you choose will depend on a variety of factors. For example, if you are using hold-down clamps (top clamping), finding the corners may be tricky if the clamps are in the way. Also, your material may not be square, or may not have a square edge to start from. In both of these examples, using the center for job zero may be more advantageous.

Steps for Setting Job Zero

To find and set job zero, complete the following steps:

1. Home your machine. See Home Your Nomad 3.
2. Secure your material to the wasteboard. See How Do I Secure Material to the Nomad 3?
3. Determine where job zero is in Carbide Create or MeshCAM:
    a. In Carbide Create, locate the origin marker (red/white circle on your canvas).
    a. In MeshCAM, locate the X/Y/Z arrows on the canvas or look for the Program Zero value.
4. Use the BitZero V2 to find and set job zero for X,Y, and Z.

What is the BitZero V2?

BitZero V2 is a low-profile touch probe designed specifically for Carbide 3D Nomad machines. It allows you to quickly and painlessly set job zero on your stock material.

You can use BitZero V2 to find the X, Y, and Z zero position, or you can use it to find only Z, only Y, or only X. As you get started with your Nomad 3, you will likely want to set job zero on one corner of your stock, so you'll need to find X, Y, and Z. Watch the Nomad 3 Gets Stock Probing Options video.

How to Use the BitZero to Find and Set Job Zero

Using the BitZero V2 to set job zero is much faster than setting job zero by hand.

To find and set job zero on one corner of your stock material:

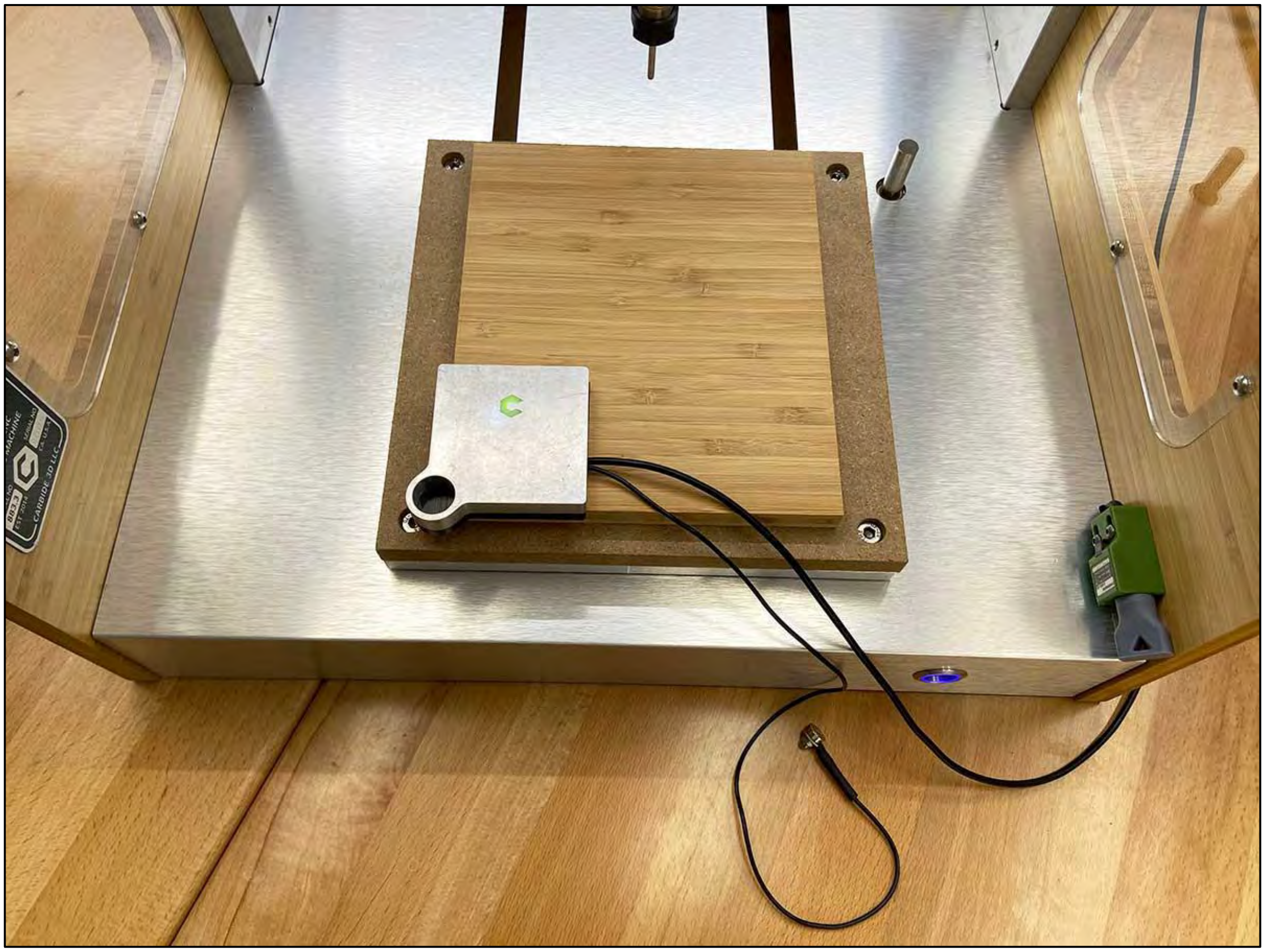
1. Make sure the BitZero V2 is plugged into the top connector on the outside of the machine enclosure.
2. Connect to and home your Nomad 3.
3. Place the included interlock key on the face of the interlock. The interlock key is specifically provided to allow you to set job zero with the protective door open.

WARNING: Do **NOT** use the interlock key to override the safety interlock while machining. Always close the machine door while the spindle is on.

4. When Carbide Motion prompts you to load a tool, install the ⅛″ probing pin into the loosened collet. See Install a Probing Pin if you need a refresher.

NOTE: While you can use an end mill with the BitZero V2, it is better to use a probing pin because the flutes of an end mill don't always register against the touch probe at the full radius of the tool. A probing pin is consistent all the way around, so no matter how it's rotated in the spindle, it will provide the most accurate results possible.

5. In Carbide Motion, click the **Resume button**. The spindle will move to the BitSetter and will automatically measure the length of the probing pin.
6. Set the BitZero V2 on a corner of your stock with the locating edges overhanging, but pressed up against the sides of your stock. Make sure the BitZero V2 cable hugs the outside of the enclosure, so there is plenty of slack cable inside the enclosure. This will help prevent the BitZero from shifting while the table and spindle move into position.



7. In Carbide Motion, click **Jog** in the top menu bar to open the *Jog screen*.
8. Jog the machine until the tip of the probing pin is just inside the circular pocket (or bore) on the corner of the BitZero V2:
    a. Use the **Y- / Y+ buttons** to position the Y-Axis (the table).
    b. Use the **X- / X+ buttons** to position the X-Axis (the spindle, moving side-to-side).
    c. Use the **Z- / Z+ buttons** to position the Z-Axis (the spindle, moving up and down).
    d. Use the **Increment +** and **Increment - buttons** to speed up or slow down the machine's movements.

Jog Shortcuts

Up Arrow: Move Y-Axis toward the front.

Down Arrow: Move Y-Axis toward the back.

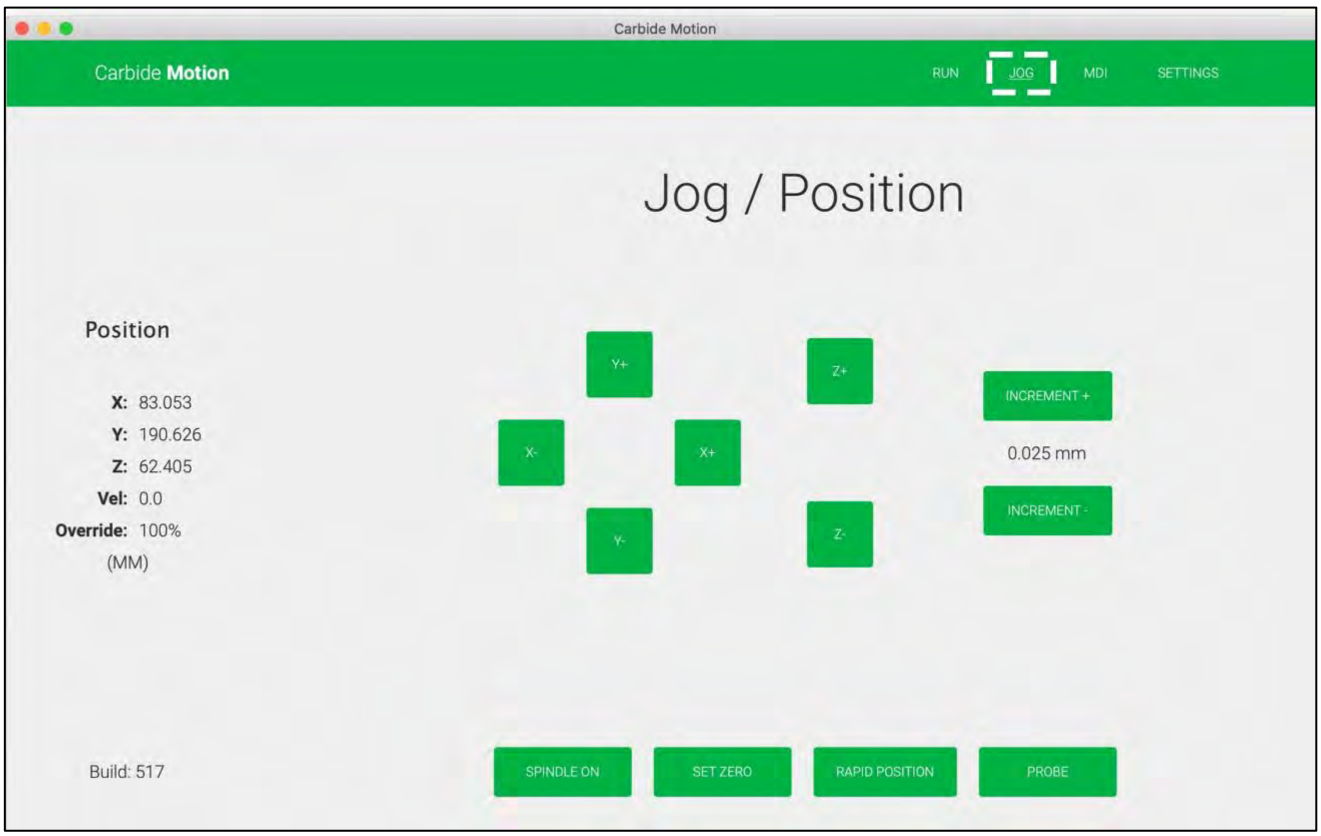
Left Arrow: Move X-Axis to the left.

Right Arrow: Move X-Axis to the right.

, (Comma): Move Z-Axis down.

. (Period): Move Z-Axis up.

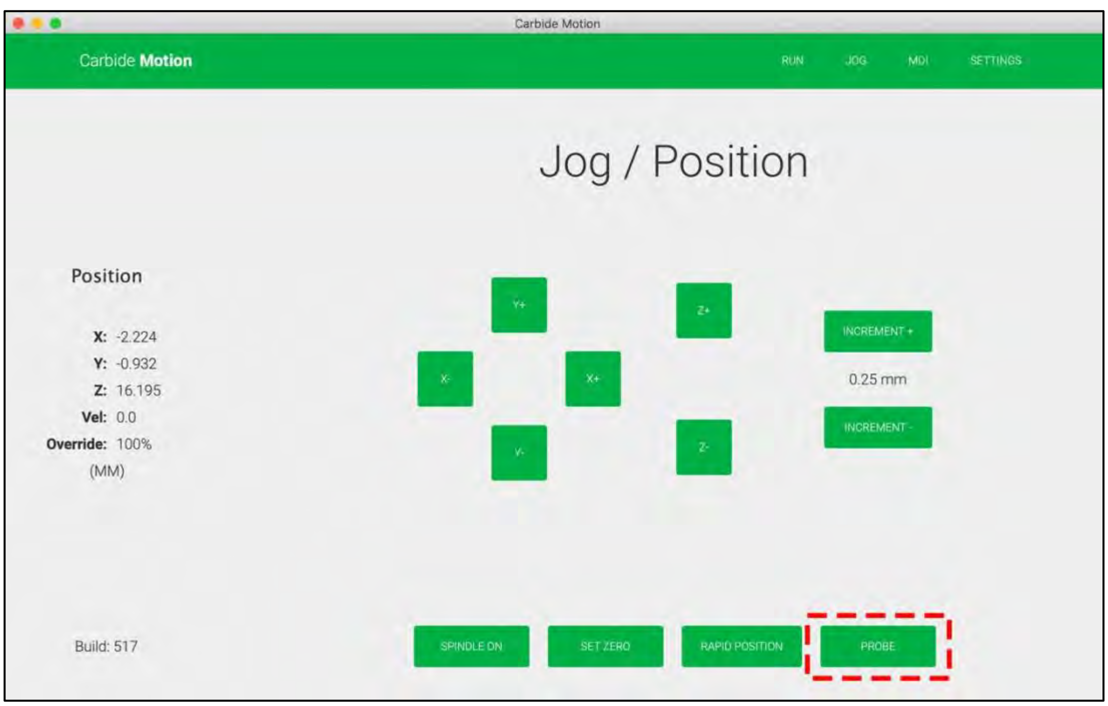
1,2,3,4: Adjust move increment



PRO TIP: You can quickly move the spindle to the bottom-left corner of your stock by clicking the **Rapid Position button**, then clicking **SW** on the *Rapid Position screen*.

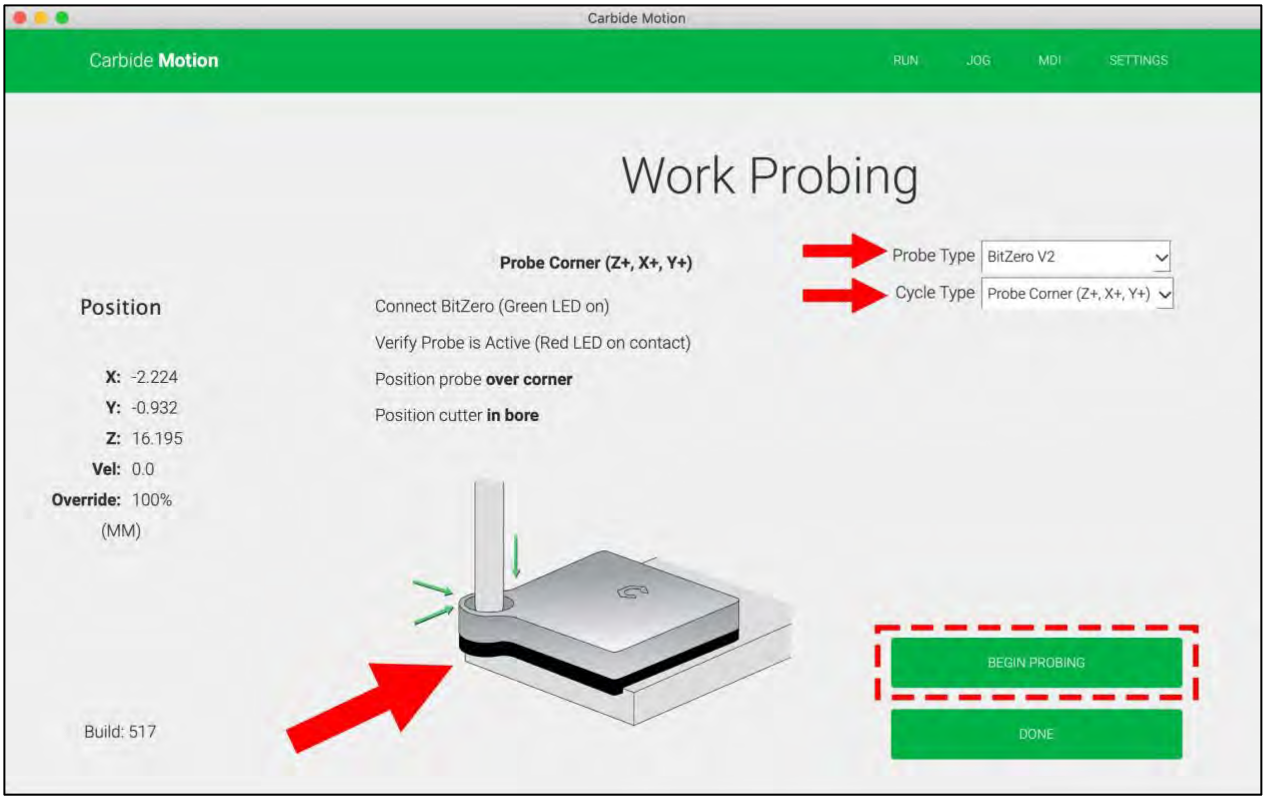
9. In order for the probing pin to register against the BitZero V2, it needs to be grounded. Attach the magnetic grounding clip, which exits the body of the BitZero, to either the collet nut or the probing pin in the spindle. If using the probing pin, make sure at least ½" of the tool remains unobstructed.

10. Confirm everything is working by tapping the BitZero body against the probing pin and checking for the status LED on the top of the BitZero to turn red.
11. Return the BitZero body to its position on the corner of your stock.
12. Click the **Probe button** to open the *Work Probing screen*.



13. In the *Probe Type dropdown list*, select **BitZero V2**.
14. In the *Cycle Type dropdown list*, select **Probe Corner (Z+, X+, Y+)**.

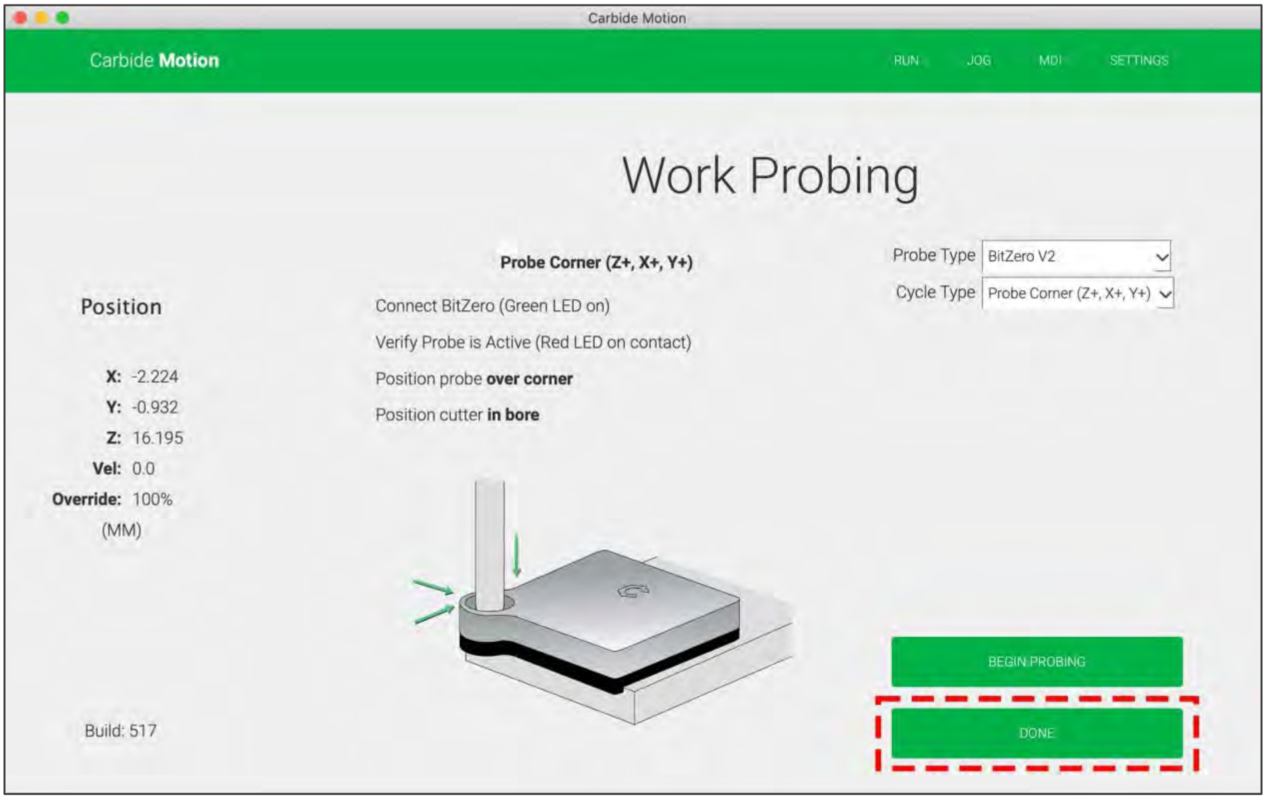
NOTE: Make sure your spindle/BitZero setup matches the image shown on the *Work Probing screen* for the *Cycle Type* you have selected. If your setup does not match the onscreen example, the calculated zero location will be incorrect.



15. Click the **Begin Probing button** to start the probing sequence.

NOTE: If you notice that your BitZero V2 moves slightly during jogging or during the probing sequence, try removing the tension in the cable by repositioning it. For example, try draping the cable up and over the side of the enclosure.

16. Once the probing sequence completes, click the **Done button** at the bottom of the *Work Probing screen* and Carbide Motion will set your zero location for X, Y, and Z.



17. Remove the BitZero V2 and grounding clip from the machine enclosure.

18. Remove the interlock key and set it outside of the machine enclosure.

What Are Toolpaths and G-code?

When your CNC machine is running, it is executing G-code, which was created by defining toolpaths. Think of toolpaths as your visual guide to “programming” your CNC machine. Toolpaths tell the machine how to cut your design into the material. They tell the machine what tool to use, what area of the material to cut, and how fast to cut. Toolpaths tell the machine how deep to cut each pass and how deep to cut when the feature is finished. The machine has both depth per pass and max depth parameters because the end mill cuts toolpath depth a little at a time, if the end mill tried to cut out the entire depth at once, it would either get stuck, or cause a tearout (a rip in the material).

You never have to look at G-code if you don’t want to. It’s not vital to know or understand how it works or how to read it. But, it is important is to understand that G-code is made from toolpaths. You will be using Carbide Create (for 2D milling) or MeshCAM (for 3D milling) to make these toolpaths.

Toolpath Types

In Carbide Create, you’ll encounter four basic toolpath types:

- **Inside Cut:** Offsets the cutter to the inside of the feature.
- **Outside Cut:** Offsets the cutter to the outside of the feature.
- **Pocket:** Clears everything inside the feature.
- **Engrave:** Cuts directly on the line (no offset).

We use the term *offset* to describe the toolpaths. In this case, offsetting means to move the cutting edge of the end mill to one side of the line or the other.

Understanding Offset and Kerf

If you were to cut a board on your miter saw to 12″, you would measure and mark a line 12″ from one end of the board. What would happen, then, if you cut the board exactly on that line, with the saw blade cutting right down the middle of the line? Would your board measure 12″ after the cut?

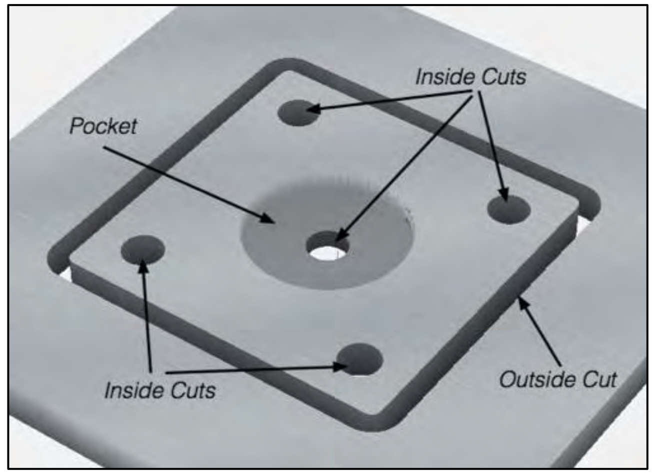
No! The board would not be cut to 12″ because of the *kerf*. The kerf is the cutting width of the blade, which, in most cases, would be ⅛″. If you cut exactly down the center of the line, half of your blade would be on one side of the line and half of your blade would be on the other side of the line. Because of this, your board would measure 1⁄16″ shorter than you anticipated.

If you wanted to cut the part to exactly 12″, you would need to keep your blade to the opposite side of the line you marked. This would ensure the blade did not cut into the material that you actually wanted to keep.

When creating toolpaths, we need to do exactly the same thing to account for the kerf. Each cutter you use will have a kerf that is equal to the cutter’s diameter. When you are creating toolpaths, it is your job to define where that kerf will be cut from by choosing the correct toolpath type for the type of part you are milling. Then, it will be Carbide Create’s job to generate the correct toolpath based on your input and the cutter’s diameter.

Now, let's take a look at the first three toolpaths again, this time with a little visual context:

- **Inside Cut:** Offsets the cutter to the inside of the feature
- **Outside Cut:** Offsets the cutter to the outside of the feature
- **Pocket:** Clears everything inside the feature



Assuming we are using a ⅛″ cutter, look at the image at right and try to imagine what would happen if you cut on the wrong side of the feature (think of the individual shapes in the part as features).

For instance, had you chosen an inside cut for the profile (the outermost toolpath that frees your part from the stock) instead of an outside cut, your part would end up ¼″ smaller than you had intended.

Why? Because your cutter has a kerf of ⅛″. So, if you cut *inside* the line (on both sides of the part), then you would have overcut ¼″ of unintended material.

The center feature (a pocket toolpath) will clear out everything *inside* of the selected feature. The toolpath in our example is slightly misleading because there is also a hole in the middle of the pocket. To accomplish this result, you would need to apply a pocket operation to the larger circle, and then an inside cut on the smaller circle inside it. Defining the parameters accordingly will allow each feature to reach a different depth of cut.

Max Depth

Max depth is your target depth. Defining this parameter tells a toolpath how deep it should cut into the material when the operation is finished. This is not the same as depth per pass. In fact, think of depth of cut as the final depth for all of the depth passes. It is important to remember also that the software will calculate how many passes it will take to reach the depth of cut. You do not have to define that. If you tell the software how deep to cut a feature, the rest will be automatically calculated.

Feeds and Speeds

"Feeds and speeds" refers to how fast the cutter should spin and how fast the cutter should be moved through the material—depending on the nature of the material and the choice of end mill. Collectively, speeds and feeds is referring to these parameters, and their values for a given use-case. The good news is you don't have to worry about speeds and feeds—unless you want to. MeshCAM automatically calculate speeds and feeds based multiple project variables, including machine, material, and cutter and Carbide Create uses a curated set of speeds and feeds based on material and use-case.

If you'd like to learn more about speeds and feeds in order to try to achieve a faster run-time or a cleaner finish, check out the Nomad Speeds and Feeds Chart and watch the Making Sense of Speeds and Feeds video.

TL;DR Summary

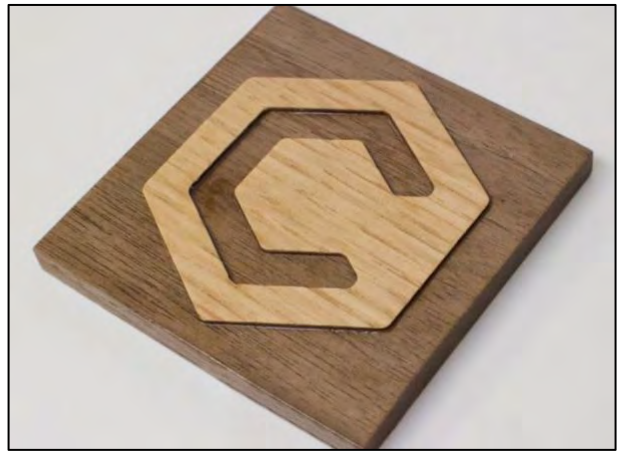
When creating toolpaths, you need to choose which tool will work best for a feature, the toolpath type, and the depth of cut. From this information, and the type of material you're using, the software will automatically calculate the appropriate speeds and feeds for your toolpath (though advanced users can input their own speeds and feeds).

Where Can I Find Tutorials & Project Inspiration?

Find Additional Tutorials

After you have completed the Nomad 3 Starter Project, visit the Carbide 3D Tutorials page for more Nomad tutorials, including:

- 3D Head Project (MeshCAM)
- Two-Toned Wood Sign Project (MeshCAM)
- Fritzing Tutorial (machine a PCB using Carbide Copper)

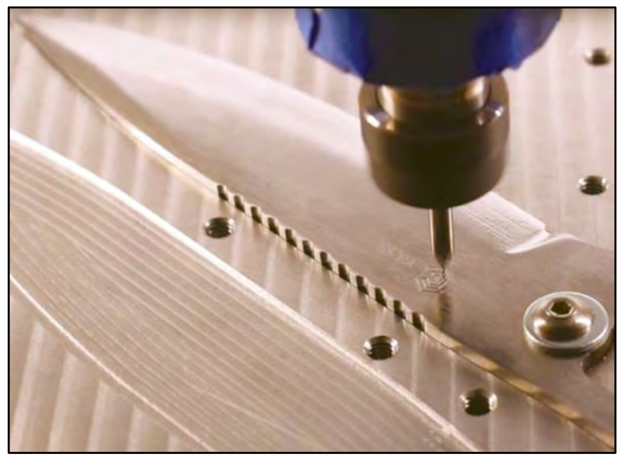


Find Projects and Inspiration on YouTube

Visit the Carbide 3D YouTube channel for video tutorial projects, machining guides, tips and tricks, and product releases. Follow along with the project videos below or use them to inspire your next project.

Metal Machining and Engraving

- Engraved Sterling Silver Disc Charm
- Carbide Camp Knife Series (design, machining, engraving, and heat-treating steel camp knives)
- Drag-Engraved Aluminum Business Cards with the Spindle Off
- Simple Silver Necklace Ideas
- Custom Graphite Mold for Metal Casting
- Metal Dominoes
- Soda Can Robots



3D Machining

- Wooden Topographic Carving
- Two-Sided Easter Island Moai
- Wooden Knife Handles
- Two-Sided Master Chief Action Figure
- Brass Signature Branding Iron
- Hardwood Legos
- HDPE Atomic Spinner

Fun Stuff

- What's the Smallest Thing You Can Machine on a Nomad?
- Acrylic and Delrin Spring-Powered Car
- MeshCAM Lithophane (artwork milled from semi-translucent material that is only seen clearly when backlit)

Find Projects and Inspiration on CutRocket

Check out CutRocket, the Carbide 3D project sharing site, to explore even more cutting projects for your Nomad 3. On CutRocket you'll find a wide variety of projects: signs, toys, games, tools, art, and storage and organization—and the project files for each. These projects will level up your machining skills and get you inspired to create your own projects!

- Brass LA Cityscape
- Wooden Puzzle Box
- Textured Brass Necklace Pendant
- Pet Tag
- Bevel Gauge for Woodworking
- Geometric Butterfly Relief
- Mountain Quote Plaque
- Acrylic Leaf Earrings
- Brass Turtle Keychain
- HDPE Business Card Holder
- Nomad Necklace
- Star Wars Rebel Alliance Keychain
- Monogram Charm
- Brass Leaf Bookmark
- Floral and Shell Magnets (Wood and Acrylic)
- "Carbide for Life" Tag
- Valentine's Day Stamps
- Gopher Hole Puzzle
- Copper Heart Bookmark
- Moon with Bats Stencil
- Book Ownership Stamp
- Aluminum, Brass, and Delrin Gears
- Acrylic Puzzle
- Copper Giraffe Bookmark
- Maple Animal Drawer Pulls
- Mini Wooden Picture Frame
- HDPE Wave Sign
- Wooden Magnet with Acrylic Silhouette Inlay

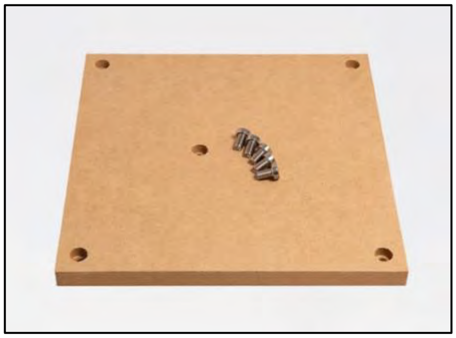
Join Our Community

Join the Carbide 3D Community! Find or start a discussion on topics such as machining questions, product announcements, software issues (Carbide Create, Carbide Motion, MeshCAM, Carbide Copper, Fusion 360, etc.), problems with tutorials, community contests, project galleries, and more.

Which Accessories Can I Use with Nomad 3?

The Nomad 3 is designed to be part of an ecosystem of products that make machining as simple as possible. Your Nomad 3 works with:

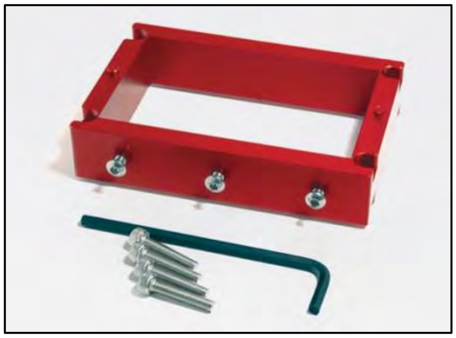
Nomad Replacement MDF Wasteboards



Replacement wasteboards for your Nomad 3 are available in the Carbide 3D store. This pack of four (4) wasteboards will make sure your aluminum table is always protected. The wasteboards are ½″ MDF and have pre-machined holes and countersinks for easily install. This pack comes with a set of mounting hardware.

Purchase

Flip Jig



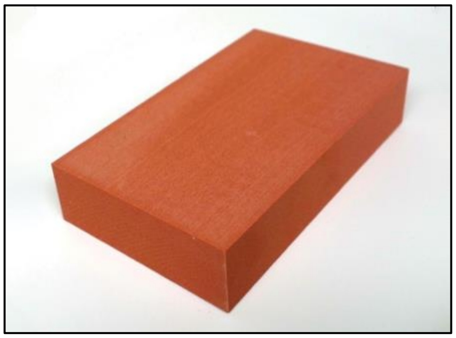
The Nomad Flip Jig allows you to cut both sides of a part while maintaining perfect alignment. The Flip Jig is precision-machined to mount to the table. It uses the built-in machine calibration to make it easy to locate it on the table (no edge finders required). The Flip Jig is made to hold stock that's just under 3″ × 5″ in size, and up to 1.2″ thick.

Watch the Two-Sided Easter Island Moai video.

Watch the Installing the Nomad Flip Jig video.

Purchase

Stock Material



The Carbide 3D store stocks a range of plastics (acrylic, Delrin and HDPE) metal (aluminum plate), synthetics (renshape, machining wax, and linoleum), and PCB.

Browse Materials

See the How Do I Secure Material to Nomad 3 section for a list of available workholding solutions on the Carbide 3D store.

What Maintenance Should I Do?

We recommend lubricating your X-, Y-Axis rails approximately every 50 hours of machining, or when you start to notice a buildup of dust and grime. We recommend lubricating your Z-Axis every 6 months. Other than the occasional lubrication, your Nomad 3 is maintenance free!

Lubricating the X- And Y-Axis

The only oil we use and recommend for lubrication of the Nomad 3's X- and Y- rails is Super Lube Synthetic Oil with PTFE. It's available from Amazon in various container sizes and types as well as some sewing machine supply shops.

To lubricate the X and Y-Axis:

1. Move the X or Y-Axis to one extreme.
2. Wipe a thin layer of Super Lube onto the rails.
3. Then, jog the lubricated axis back and forth a few times. Most of the oil will be pushed aside by the bearing seals but some of it will get in there, and that is enough to do the job.
4. After you've jogged the axis back and forth a few times, wipe the remaining oil from the rails so that it doesn't attract dust.

Lubricating the Z-Axis

To lubricate the Z-Axis:

1. Put a quick coat of synthetic oil (such as Mobil Vactra No. 2 Oil) on the linear rails and leadscrew.

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.

Close the machine's protective 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 3 to your computer:

a. Power up the computer.
b. Connect the USB cable to your computer.
c. Start Carbide Motion on your computer.
d. Press the Power button to turn your Nomad 3 on.
e. In Carbide Motion, connect to the machine.
f. Home the machine.

7. Install a Probing Pin and Set Up the BitZero V2

Load a probing pin in the collet and position the BitZero V2 on a corner of your stock.

8. Set Job Zero

Move your spindle to the BitZero V2 and begin the probing sequence.

9. Remove the BitZero V2

Remove the grounding clip and place the BitZero V2 outside the machine enclosure.

10. Double Check the Work Area

Ensure that nothing has been left in the work area. Make sure the door is closed.

11. 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 (this is best done with a loupe or magnifying glass). Install the end mill per the instructions in the Install an End Mill section. Check to make certain that the collet is tight and will not work loose during operation (it needs to be more than finger-tight—the machine will take no notice or care if it works loose).

12. 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.

13. Monitor the Machine During Operation

Monitor the machine during operation. Ensure there is no build-up of dust, debris, or fumes, and that nothing works loose. Do not reach into the machine's working envelope or insert any object into it while the machine is operating. If you attempt to open the protective door during machining, the job will pause and the spindle will stop and park.

14. 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 3.

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. The easiest way to clean end mills and collets is by dipping them into a suitable solvent such as isopropyl alcohol. Make sure to let the alcohol complete evaporate before using again.

CNC Glossary

CAD (Computer Aided Design): CAD is where you turn your idea into a digital design! CAD is software that allows you to draw on your computer. This can be anything from a full-blown parametric 3D modeling package like Solidworks, to something as simple as Adobe Illustrator. Don't let the word CAD scare you. All it means is 'a program to draw in'.

CAM (Computer Aided Manufacturing): CAM is where you turn your CAD design into something your CNC machine can understand. CAM is software that lets you specify HOW your design is going to be made on your CNC machine. Your CAM program will output G-code. Like most terminology around CNC, CAM sounds scarier than it really is.

Collet: A collet is a cone-shaped sleeve that holds an end mill in place in the spindle.

End Mill / Cutter / Tool: End mills are the cutting tools used by your Nomad 3. End mills are similar to drill bits, though, typically they can cut in all directions. They come in several varieties, such as square, ball nose, and V-bit, and many sizes.

G-code: G-code (general, or geometric, code) is a CNC programming language that controls when, where, and how the machine moves across the workpiece (for example, when to turn on or off, how fast to travel to a particular location, what paths to take, etc.).

Home: Homing your machine is the process of sending it to a known, fixed, repeatable location. This means that every time you home, the machine will move to exactly the same position allowing you to move your machine to positions relative to the home position, with great precision. On your Nomad 3, the home is position is the back-right corner.

Interlock: Nomad 3 has an interlock which prevents the door from being opened while the machine is operating. When the door is opened, the current job will pause and the spindle will stop and move to a parked location.

Interlock Key: The interlock key is a small magnetic key that allows you to disengage the Nomad 3's safety interlock. The interlock key is provided so you can set job zero with the door open. **Never use the interlock key while the spindle is on.**

Job Zero / Job Origin / Toolpath Zero / Program Zero: It may have many names, but job zero basically tells the machine where to begin running the job. Job zero is a point in your design where all of the toolpaths will be based from (the X, Y, and Z coordinates). Job zero is most commonly set in the lower-left corner of your stock.

Jog: Move the spindle to a specific position (a set of X, Y, Z coordinates) in the work area.

Spindle: The spindle is the part of the Nomad 3 that turns the end mills. The Nomad 3 spindle has a 130W motor with 9–24k RPM and angular contact bearings for greater rigidity.

Stock / Workpiece / Material: The sheet of material (wood, plastic, composite/synthetic, metal) being machined.

Table: The Nomad 3's aluminum table holds your wasteboard and your material for machining. The table is your Y-Axis and it moves forward and backward.

Toolpath: A toolpath is the "route" the cutting tool will follow as it shapes the workpiece. We use Carbide Create or MeshCAM to define the toolpaths for a project.

Tool Change: When running a job that require multiple tools, Carbide Motion will prompt you each time you need to change tools. After each tool change, your Nomad 3 will use the BitSetter to measure the length of the new tool.

Wasteboard: The wasteboard is a sacrificial surface that is installed to your machine's table. It allows for easy through-cutting operations (e.g. projects in which a part is cut completely from the surrounding stock) without the worry of damaging your end mill or table. Wasteboards are often customized with a grid of drilled holes which allow for workholding options such as top clamps.

Working Envelope: A working envelope is the CNC machine's range of movement across its three axes: X, Y, Z.

Workholding / Hold-Down Solution: These are the options for securing your stock material to the machine table.

Date ____________________

Project Name ____________________

Material 1 ____________________

Dimensions ____________________

Material 2 ____________________

Dimensions ____________________

Fixture(s) ____________________

Image

Origin(s) ____________________

Setup Notes ____________________

Nomad 3 Operations and Maintenance Checklist

BEFORE EACH USE

- ☐ Workpiece Secure
- ☐ Work Area Clear
- ☐ End Mill Secure
- ☐ BitZero V2 Removed

SAFETY

- ☐ PPE
- ☐ Dust Extraction
- ☐ Emergency Stop

CHECK CONDITION

- ☐ Collet & Cutter
- ☐ Enclosure Door
- ☐ Interlock
- ☐ Spindle
- ☐ Rails
- ☐ Wasteboard/Table

MAINTENANCE

- ☐ Lubricate X & Y (~6 mo)
- ☐ Lubricate Z (~50 hrs)

Tool Chain

	End Mill	RPM	Feed Rate	Time (hours / minutes)
1.				/
2.				/
3.				/
4.				/
5.				/
6.				/
			Total Cutter Time	/

Total Project Time

Estimated (hrs/mins) ______ / ______

Actual (hrs/mins) ______ / ______

Start Time ____________

End Time ____________

Total Machine Hours

____