



K40+ | 40W | CO₂ Desktop Laser Engraver User Manual

For Commercial or Industrial Use Only



Read Carefully Before Use
Keep for Future Reference



BEAMING WITH POSSIBILITIES!

Thank you for choosing the OMTech as your new laser engraver!

This CO₂ laser is intended for commercial or industrial use. When used as instructed, the K40+ is a Class I laser system but the active laser is invisible and must be used with great care to avoid serious property damage and severe personal injury. It works by emitting a powerful laser beam from a glass tube filled with carbon dioxide, nitrogen, and insulating gases; reflecting that beam off three mirrors and through a focal lens; and using this focused light to etch designs into a wide variety of materials including wood and cork, paper and cardboard, most plastics, glass, cloth and leather, and stone. It can also be used with some specially coated metals. With low intensity use, the provided tube has an average lifespan around 10,000 hours before requiring replacement. However, constantly running your laser above 70% of its rated power can significantly shorten its service life.

Read this manual before use, keep it for future reference, contact OMTech customer service if any point is unclear, and provide it with the machine if it is ever given or sold to another person.



Welcome to the OMTech Community!

For helpful hints and instructional videos, visit our **Help Center** or join our official laser group! If you encounter any issues with your engraver, please feel free to contact us. Our support team will respond **ASAP** to resolve your concerns.

Help Center

help.omtechlaser.com/hc/en-us | 🔍

[First Time Setup](#) | [Safety](#) | [Maintenance](#) | [Troubleshooting](#) | [FAQ](#) | [Hot Tips](#)



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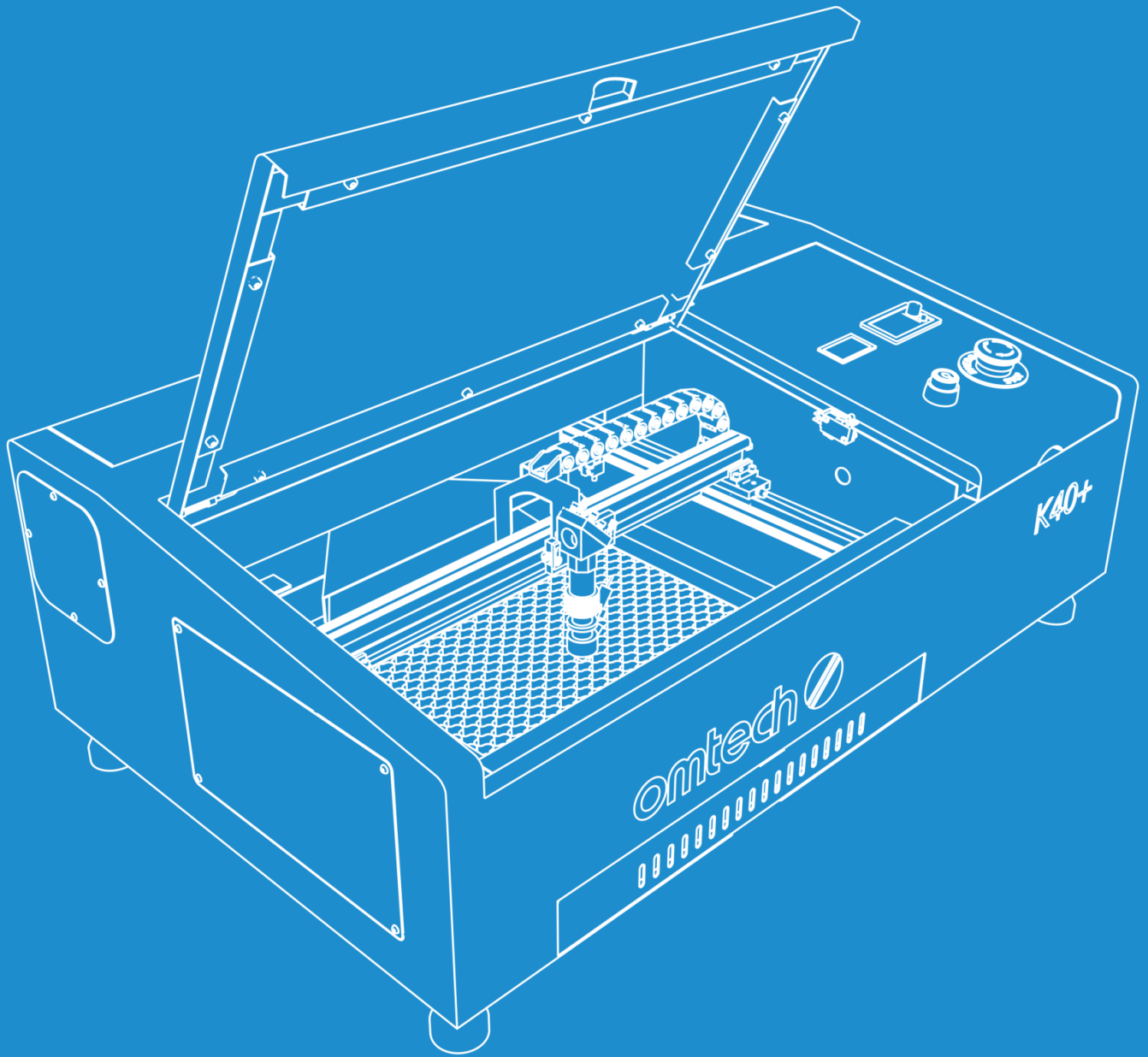
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1 Safety Information

1.1 Disclaimer

Read this disclaimer completely and carefully before proceeding with the rest of the manual content.

1. **As-Is**

This OMTech product is sold 'as is' and without any express or implied warranties, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.

2. **Product Modifications**

Any modifications or alterations to OMTech products void any warranties and may result in damage or injury. OMTech shall not be liable for any damages resulting from such modifications or alterations.

3. **Compliance with Laws**

Customers shall be liable for ensuring that the use of OMTech products complies with all applicable laws and regulations in their respective jurisdictions. OMTech assumes no responsibility for any violations of laws or regulations resulting from the use of OMTech products.

4. **Correct Use**

Always use OMTech products only as directed in the accompanying manuals. Failure to follow instructions may result in injury or damage.

Always ensure the assembly, installation, operation, maintenance, or repair of OMTech products is carried out by a competent person.

Always make maintenance regularly throughout OMTech products' lifecycles; you have the liability to keep the products operating as intended.

Always wear appropriate protective gear.

5. **Third-Party Products**

OMTech shall not be liable for any damages or losses resulting from the use of third-party products in conjunction with OMTech products. Customers shall refer to the third-party's guidelines or/and warranties (if any) for any third-party products used.

6. **Limitation of Liability**

OMTech shall not be liable for any direct, indirect, punitive, incidental, special, or consequential damages to property or life, whatsoever arising out of or connected with the use or misuse of OMTech products. In no event shall OMTech's liability exceed the value of the products sold.

This disclaimer states the entire obligation of OMTech with respect to OMTech products. If any part of this disclaimer is determined to be void, invalid, unenforceable, or illegal, including but not limited to the warranty disclaimers, liability disclaimers, and liability limitations set forth above, the invalid or unenforceable provision will be deemed superseded by a valid and enforceable provision that most closely matches the intent of the original provision and the remainder of the agreement shall remain in full force and effect.

1.2 Symbol Guide

The following symbols are used on this machine's labeling or in this manual:



These items present a risk of serious property damage or personal injury.



These items address similarly serious concerns about the laser beam.



These items address similarly serious concerns about electrical components.



These items address similarly serious concerns about fire hazards.



These items address pinching and crushing hazards.



Protective eyewear should be worn by anyone around this machine during operation.



This product is sold in conformity with applicable EU regulations.

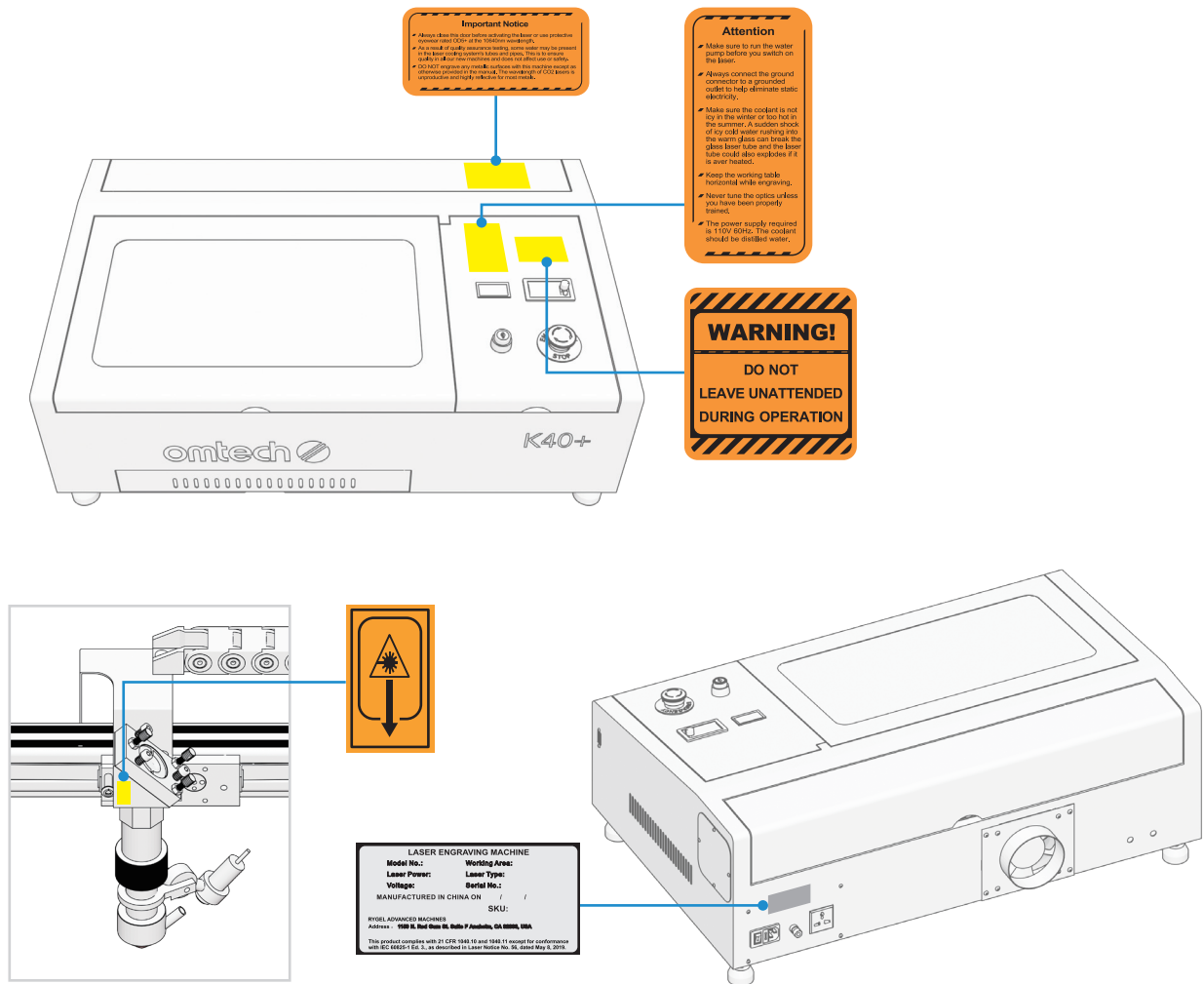


This product contains electrical components that should not be disposed of with regular garbage.

1 Safety Information

1.3 General Safety Instructions

- Your engraver should come with instruction labels in the following locations.





If any of these labels is missing, illegible, or damaged, it must be replaced.

- Use this laser engraving engraver only in accordance with all applicable local and national laws and regulations.
- Use this engraver only in accordance with this instruction manual and the manual for the engraving software included with it. Only allow this engraver to be installed, operated, maintained, repaired, etc. by others who have also read and understood both manuals. Ensure that this manual and the software manual are both included with this engraver if it is ever given or sold to a third party.

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.




- The system must be operated, maintained, and repaired by personnel familiar with the field of use and the dangers of the machine and the material being engraved including its reflectivity, conductivity, potential for creating harmful or combustible fumes, etc.
- **DO NOT** operate continuously for more than 2 hours. Stop for at least 30 minutes between uses.
- **DO NOT** operate this engraver with its cooling liquid hotter than 100°F (38°C). If this temperature is ever approached, stop using the laser but allow the exhaust and water-cooling systems to continue running to clear and cool the machine.
- **DO NOT** leave this engraver unattended during operation. Observe the engraver throughout the operation and, if anything seems to be operating strangely, immediately cut off **ALL** power to the machine and contact either our customer service or your dedicated repair service. Similarly, ensure the engraver is **FULLY** turned off (including using the **Emergency Stop** switch) after each use. 
- **DO NOT** allow minors, untrained personnel, or personnel suffering from physical or mental impairment that would affect their ability to follow this manual and the software manual to install, operate, maintain, or repair this engraver.
- Any untrained personnel who might be near the engraver while it is in operation **MUST** be informed that it is dangerous and fully instructed on how to avoid injury during its use.
- **ALWAYS** keep a fire extinguisher or other flame-retardant system nearby in case of accidents. Ensure that the local fire department's phone number is displayed nearby. In the case of a fire, cut electrical power before dousing the flame. Familiarize yourself with the correct range for your extinguisher before use. Take care not to use the extinguisher too close to the flame, as its high pressure can produce blowback. 

1.4 Laser Safety Instructions

This machine complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

When used in accordance with these instructions, it is a **CLASS 1** laser product. But it embeds a **CLASS 4** laser system and some components remain **EXTREMELY** dangerous under improper and/or non-intended use. Used or modified without care, they can cause serious property damage and personal injury including but not limited to the following:

- The laser will easily burn nearby combustible materials
- Some working materials may produce radiation or harmful gasses during processing
- Direct exposure to the laser will cause bodily harm including serious burns and irreparable eye damage 

1 Safety Information

As such,

- **DO NOT** modify or disable this engraver's provided safety features. Do not modify or disassemble the laser and do not use the laser if it has been modified or disassembled by anyone except trained and skilled professionals. Dangerous radiation exposure and other injury may result from the use of adjusted, modified, or otherwise incompatible equipment.
- **NEVER** leave any part of the engraver open during operation. Never interfere with the laser beam, do not place any part of your body in any part of the laser path during operation, and never attempt to view the laser directly. When risking exposure to the laser beam, take measures to protect yourself from potentially reflected laser beams including the use of personal protective equipment such as protective eyewear specially designed to filter the specific wavelength of your engraver's laser with an optical density (OD) of 5 or higher.
- **DO NOT** stare or allow others to stare continuously at the laser beam during operation even when the cover is closed and/or wearing protective eyewear. Exercise caution with the red dot positioning light as well, as its direct beam is a **CLASS 4** laser in its own right.
- **ONLY** use this engraver if its automatic shutoffs are working properly. When you first get this engraver and if you subsequently notice any problems, test them (see [§5 Initial Testing](#) on Page 36) before undertaking any other work. Do not continue use if the shutoffs do not occur. Turn off the engraver and contact customer service or your repair service. Never disable these shutoffs.
- **DO NOT** ever under **ANY** circumstances use this laser engraver if the water-cooling system is not working properly. Always activate the water-cooling system and visually confirm that water is flowing through the entire system before turning on the laser tube. Immediately stop use if the water-cooling system malfunctions.
- If using the provided water pump, ensure that it is placed in a tank full of cool or tepid distilled water. Do not use ice water or allow the water to become hotter than 100°F (38°C). For best results, keep it between 60°F–70°F (15°C–21°C). Replace heated water or add sealed bottles of frozen water to cool it while never allowing the system to run without water or allowing the water to become colder than 50°F (10°C). Immediately stop use if the water cooling system malfunctions.
- **DO NOT** use generic antifreeze in your cooling water, as they may leave corrosive residues and solidify inside your hoses and piping, causing malfunctions and even explosions. Use custom laser-safe formulations or use and store your engraver in a climate-controlled area.
- **DO NOT** leave potentially combustible, flammable, explosive, or corrosive materials nearby where they could be exposed to the direct or reflected laser beam.
- **DO NOT** use or leave sensitive EMI equipment nearby. Ensure the area around the laser is free of strong electromagnetic interference during any use.
- **ONLY** use this machine to work on materials described in [§1.6 Material Safety Instructions](#) on Page 6. The laser settings and engraving process must be properly adjusted for specific materials.
- Ensure the area is kept free of other airborne pollutants, as these might pose a similar risk of reflection, combustion, etc.

1.5 Electrical Safety Instructions

- **ONLY** use this engraver with a compatible and stable power supply with less than **5%** fluctuation in its voltage.
- **DO NOT** connect other devices to the same circuit, as the laser system may require its full amperage.
- **DO NOT** use standard surge protectors, extension cords, or power strips. Only use additional wiring thick enough to safely handle the full load of the machine. Use only surge protectors rated over 2000 J.
- **ONLY** turn on the power to this engraver when it is well grounded, either via a firm connection to a 3-prong outlet or via a dedicated grounding cable firmly connected to the proper slot on the engraver. Do not use an ungrounded 3-to-2 prong adapter. The engraver's grounding should be checked regularly for any damage to the line or loose connections.
- The area around this laser engraving engraver should be kept dry, well-ventilated, and environmentally controlled to keep the ambient temperature between **40°F–95°F (5°C–35°C)**. For best results, keep the temperature at **75°F (25°C)** or below. The ambient humidity should remain between **70%**.
- Adjustment, maintenance, and repair of the electrical components of this engraver must be done **ONLY** by trained and skilled professionals to avoid fires and other malfunctions, including potential radiation exposure from damage to the laser components. Because specialized techniques are required for testing the electrical components of this marking system, it is recommended such testing only be done by the manufacturer, seller, or repair service.
- Unless otherwise specified, **ONLY** undertake adjustment, maintenance, and repair of the engraver when it is turned off, disconnected from its power supply, and fully cooled.



1.6 Material Safety Instructions

- Users of this laser engraving machine are responsible for confirming that the materials to be processed can withstand the heat of the laser and will not produce any emissions or byproducts either harmful to people nearby or in violation of local or national laws or regulations. In particular, do not use this engraver to process polyvinyl chloride (PVC), Teflon, or other halogen-containing materials under any circumstances.
- **DO NOT** use high power settings at very low speeds when engraving highly flammable materials. Instead, use more repetitions of your design at low power settings to achieve a similar effect.
- Users of this laser engraver are responsible for ensuring that every person present during operation has sufficient PPE to avoid injury from the emissions and byproducts of the materials being processed. In addition to the protective laser eyewear described above, this may require goggles, masks or respirators, gloves, and other protective outer clothing. Always wear hand protection when working with metal to avoid cuts and burns.

1 Safety Information

- **DO NOT** ever under **ANY** circumstances use this laser engraver if the exhaust system is not working properly. Always ensure that the exhaust fan can remove the dust and gas produced by the engraving process in accordance with all applicable local and national laws and regulations. Immediately stop use if the exhaust fan or vent hose malfunctions. Periodically check the air assist intake filter to ensure it stays free of any dust or debris.
- Exercise special caution when working with moderately conductive materials such as carbon steel and stainless steel, as prolonged work can build up residual heat and reflective dust and particles that may damage electrical components, cause short circuits, or produce other effects including reflected laser radiation.

This machine can be safely used with the following materials:

CAN be used

Plastics

- Acrylonitrile Butadiene Styrene (ABS)
- Nylon (Polyamide, PA, etc.)
- Polyethylene (PE)
- High-Density Polyethylene (HDPE, PEHD, etc.)
- Biaxially-oriented Polyethylene Terephthalate (BoPET, Mylar, Polyester, etc.)
- Polyethylene Terephthalate Glycol (PETG, PET-G, etc.)
- Polyimide (PI, Kapton, etc.)
- Polymethyl Methacrylate (PMMA, Acrylic, Plexiglass, Lucite, etc.)
- Polyoxymethylene (POM, Acetal, Delrin, etc.)
- Polypropylene (PP, etc.)
- Styrene

Others

- Cardboard
- Ceramics, including Dishes, Tile, etc.
- Glass
- Leather
- Paper & Paperboard
- Rubber
- Stone, including Marble, Granite, etc.
- Textiles, including Cotton, Suede, Felt, Hemp, etc.
- Wood, including Cork, MDF (Medium Density Fiberboard), Plywood, Balsa, Birch, Cherry, Oak, Poplar, etc.

See [§6.4 Instructions for Specific Materials](#) on Page 61 for the recommended parameters for the most commonly engraved materials.

This machine **CAN NOT** be used with the following materials or with any materials that include them:

CAN NOT be used

- Artificial Leather containing Hexavalent Chromium (Cr [VI]), due to its toxic fumes
- Astatine, due to its toxic fumes
- Beryllium Oxide, due to its toxic fumes
- Bromine, due to its toxic fumes
- Chlorine, including Polyvinyl Butyral (PVB) and Polyvinyl Chloride (PVC, Vinyl, Sintra, etc.), due to its toxic fumes
- Fluorine, including Polytetrafluoroethylenes (Teflon, PTFE, etc.), due to its toxic fumes
- Iodine, due to its toxic fumes
- Metals, due to their conductivity and reflectivity Phenolic Resins, including various forms of Epoxy, due to their toxic fumes
- Polycarbonate (PC, Lexan, etc.), due to its toxic fumes

For all other materials, if you are unsure about its safety or laserability with this engraver, seek out its material safety data sheet (MSDS). Pay special attention to information about safety, toxicity, corrosiveness, reflectivity, and reaction(s) to high heat. Alternatively, contact our support department for further guidance.

1.7 Disposal Safety Instructions



Electrical products should not be disposed of with household products. In the EU and UK, according to the European Directive 2012/19/EU for the disposal of electrical and electronic equipment and its implementation in national laws, used electrical products must be collected separately and disposed of at the collection points provided for this purpose. Locations in Australia, Canada, and the United States may have similar regulations.

2 Introduction

2.1 General Information

This manual is the designated user guide for the installation, setup, safe operation, and maintenance of your laser engraver. It is divided into several chapters covering general information, safety instructions, installation steps, operation and adjustment instructions, maintenance procedures, and contact information.

ALL personnel involved in the installation, setup, operation, maintenance, and repair of this machine should read and understand this manual, particularly its safety instructions. Some components are extremely high voltage and/or produce powerful laser radiation. Substandard performance and longevity, property damage, and personal injury may result from not knowing and following these instructions.

Your laser engraver works by emitting a powerful laser beam from a glass tube filled with insulating carbon dioxide (CO₂). The laser beam reflects off three mirrors and passes through a focus lens, after which the focused light can etch designs into certain substrates. The first mirror is fixed near the end of the laser tube, the second mirror travels along the machine's Y axis, and the third mirror is attached to the laser head that travels along the X-axis. Because some dust from the engraving process settles on the mirrors, they require frequent cleaning. They also require periodic readjustment using their attached positioning screws to maintain proper laser path alignment. A water cooling system—typically a pump or chiller—must be used with this engraver to dissipate the heat produced by the laser tube. Similarly, an exhaust system—typically either an external vent or a dedicated air purifier—must be used to remove the dust and gases produced by the engraving process.

With low-intensity use, the provided laser tube has an average lifespan of around 2000 hours before requiring replacement. However, constantly running your laser above 70% of its maximum rated power can significantly shorten its service life. It is recommended to use settings from 10%–70% of the maximum rated power to enjoy optimal performance and longevity.

Note that this is a high-voltage device and, as a safety precaution, it is recommended to only touch its components with one hand at a time during use.

Note that the active laser is invisible to the human eye. Never operate this device while any cover is open to avoid potentially permanent injury.

Note also that the water cooling system and exhaust system are both absolutely essential to the safe use of this device. Never operate the engraver without both of these systems working correctly. Cooling water should always be kept clean and around room temperature, and the exhaust system should always comply with all applicable laws and regulations for workplace and environmental air quality.

2.2 Designated Use

This machine is intended for engraving signs and logos on consumer products or applicable substrates, for commercial or industrial use **ONLY**. Its laser can process a wide variety of materials including wood and cork, paper and cardboard, most plastics, glass, cloth and leather, and stone. It can also be used with some specially coated metals. Use of this system for non-designated purposes or materials is not permitted.

2.3 Specifications

Model		K40+	
Input Power		AC 220–240 (V), 50 Hz	
Power Consumption		350 W	
Rated Power		40 W	
Expected Service Life at <40% / 40–70% / >70% Power		2000/1200/600 hr.	
Laser Wavelength		10640 nm	
Laser Tube	Diameter	1.97 in.	50 mm
	Length	28.3 in.	720 mm
Focus Lens	Diameter	0.47 in.	12 mm
	Thickness	0.08 in.	2 mm
	Focal Length	2 in.	50.8 mm
Mirror	Diameter	0.79 in.	20 mm
	Thickness	0.12 in.	3 mm
Processing Area (L×W)		12×8 (in.)	300×200 (mm)
Max. Processing Speed		11.8 ips	300 mm/s
Max. Acceleration	X-Axis	78.7 ips ²	2000 mm/s ²
	Y-Axis	59.1 ips ²	1500 mm/s ²
Min. Engraving Depth		0.008 in.	0.2 mm
Max. Engraving Depth		0.12 in.	3 mm
Max. Resolution		500 dpi	
Max. Engraving Material Thickness		1.2 in.	30 mm
Min. Line Width		0.02 in.	0.51 mm
Precision		±0.01 in.	±0.25 mm
Required Operating Environment	Max. Humidity	70%	
	Temp. Range	40–95 (°F)	5–35 (°C)
Provided Operating Software		LaserGRBL	
Supported Operating Software		LightBurn	
Supported Image Formats		.ai, .bmp, .dxf, .emf, .gif, .hpgl, .jpeg, .pdf, .plt, .png, .rd, .svg, .tiff, .tga, .wmf	
Graphic Operating Modes		Raster, Vector, Combined	
Certification		CE, FDA	
Net Weight		64.9 lb.	29.5 kg

2 Introduction

2.4 Package List



A



B



C



D



E



F



G



H



I



J



K



L



M

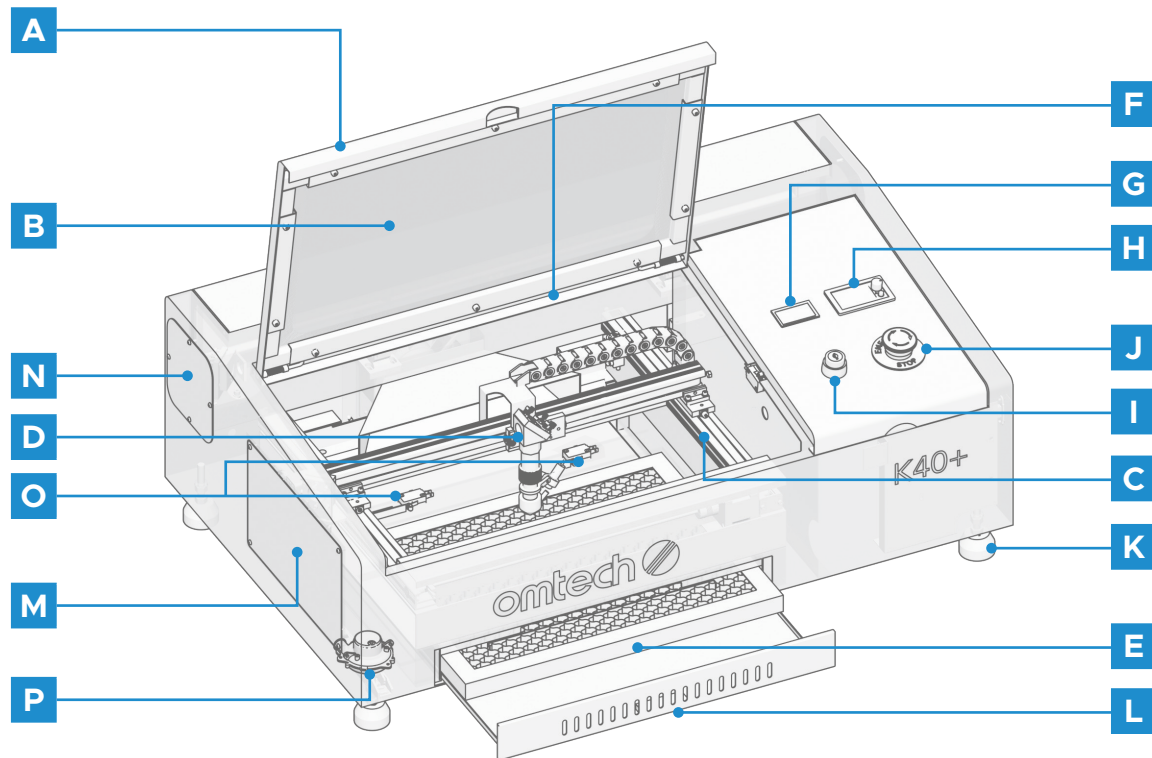
Item	Name	Qty.
A	Water Pump (With Four Feet and One Connector)	1
B	Acrylic Focusing Ruler	1
C	Exhaust Pipe	1
D	Hose Clamp	1
E	Power Cord	1
F	Acrylic Test Plate	1
G	USB Flash Drive with Engraving Software Included	1
H	USB Cable	1
I	Laser Keys	2
J	Ceramic Testing Resistor ⁽¹⁾ with its Separate Manual	1
K	Double-sided Tape	1
L	Silicone Sealant ⁽²⁾	1
M	Open-end Wrench	1

(1) Used to determine whether the fault originates from the laser power supply.

(2) Used to secure and position the connection terminals and mirrors properly after maintenance.

3 Components

3.1 Front View

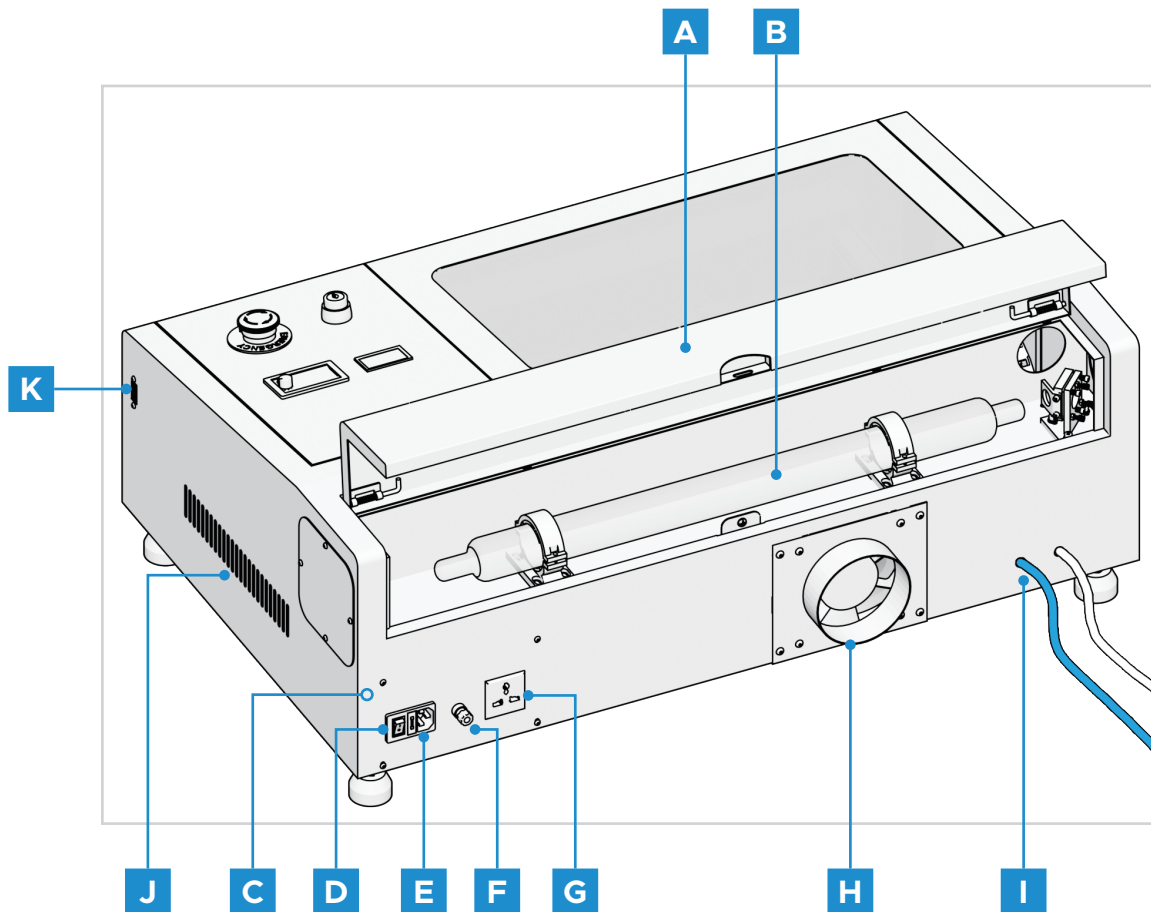


A	Cover	The cover provides access to the main bay for placing and retrieving materials, as well as fixing the laser path alignment and other maintenance. The power to the laser is automatically cut when the cover is opened.
B	Viewing Window	This polycarbonate window protects you and others from the laser and its reflection, allowing monitoring of the engraving process. However, you should never stare continuously at the laser during operation, even through the window.
C	X-Axis Rail	The X-axis rail, which holds the 2nd mirror and enables the laser head to move left and right across the workbed, travels along the Y-axis within a range controlled by limit switches.
D	Laser Head	The laser head holds the 3rd mirror, the focus lens, the air assist outlet, and the red dot guidance.
E	Workbed	The removable worked provides protection for the debris tray below. The honeycomb bed can be removed to make way for thicker laserable workpiece.

F	LED Light Strip	The integrated light keeps your workbed easy to see.
G	Temperature Gauge	This gauge monitors the temperature of your laser tube's cooling water in degrees Celsius ($\pm 3^{\circ}\text{C}$). Do not allow the reading to exceed 38°C . If the temperature approaches this value, stop work and allow your device to cool before further use.
H	Ammeter	<p>This digital display shows the current being provided to the laser tube in mA. The knob to its right is its master power control. It should be turned completely clockwise to MAX to enable the software to use the engraver's full power range and can be used as master control for the laser's power settings. When it is turned completely clockwise to MAX, it is recommended to use settings from 10%–70% in the SOFTWARE of the maximum rated power to enjoy optimal performance and longevity.</p> <p>However, you can also partly turn it clockwise, and when it is set to anything other than MAX, it reduces the SOFTWARE's power settings by a proportionate amount.</p>
I	Laser Lock	This lock turns on and off the power supply to your laser tube and air assist using the laser key.
J	Emergency Stop	This button cuts all power to the laser tube and stops the machine immediately in the event of an emergency. Release it during startup to turn on your engraver's control system, exhaust fan, and water pump socket. Turn it on before the laser key and press it off after.
K	Legs	These padded legs help anchor the machine in place and avoid any damage to your table or counter.
L	Debris Tray	This tray is for collecting debris. Empty it regularly. There are also two emergency shutoff interlocks for the tray. Remove the tray and pin the interlock down using the nearby bracket before using a rotary axis or engraving thick materials. Do not forget to place a sacrificial base, preferably a non-reflective steel sheet, between your table and engraver.
M	Maintenance Door 1	This door provides access to the second mirror and air assist pump for maintenance.
N	Maintenance Door 2	This door provides access to the first mirror for maintenance.
O	Tray Interlocks	<p>These switches cut all power to the laser tube and stops the machine immediately in the event of an emergency. They must be held closed by the nearby bracket after the debris tray is removed for engraving thick materials or using the rotary axes. Remember to reenable the switches by removing the bracket after your work.</p> <p>This is the only safety feature that should ever be circumvented.</p>
P	Air Assist Pump	This pump blows away the minute debris and smoke away from the laser lens, preventing debris from building up and thus lengthening the service life of the laser head.

3 Components

3.2 Rear View

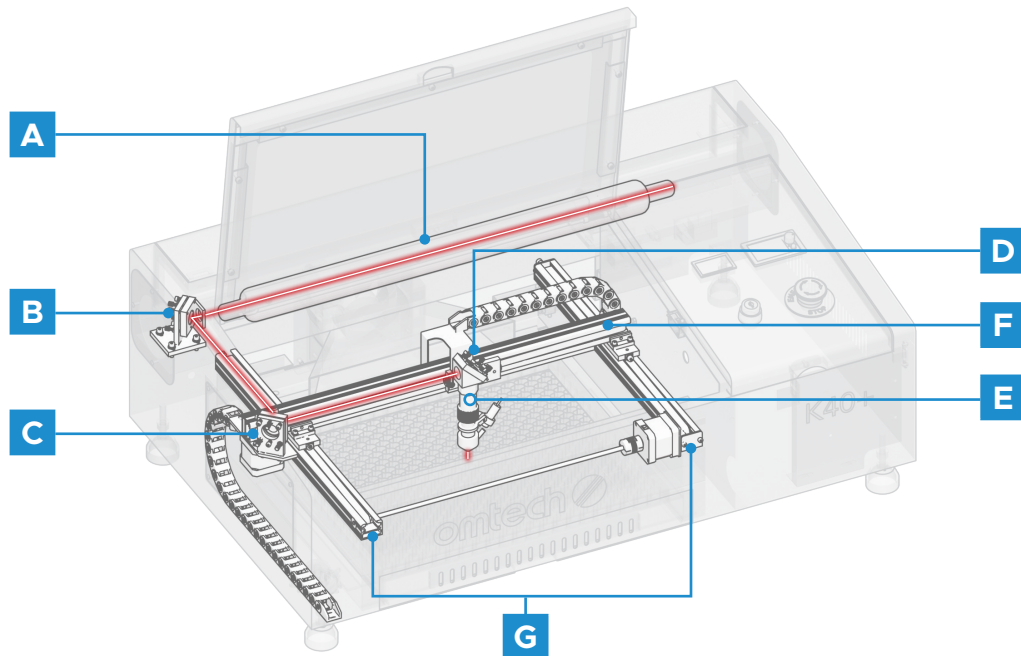


A	Rear Access Door	This door provides access to the laser bay, including the laser tube, its brackets, its electrical and cooling water connections, and the 1st mirror.
B	Laser Tube	This long glass tube is filled with helium, nitrogen, and CO ₂ gas and cooled water to safely produce a powerful laser. Its connection to the laser power supply is extremely high voltage and extremely dangerous. Although the active laser should be directed into the main bay, its reflections may remain dangerous. Wear laser glasses while the tube is active.
C	Water Sensor	This device (not shown) is attached to the water outlet and provides the reading for the control panel's water temperature gauge.
D	Power Switch	This switch turns on the engraver's main power and LED lighting, and places the exhaust fan and air assist into standby mode, ready to activate after the Emergency Stop button is turned on. It should always be turned off between sessions.

E	Power Socket	This socket connects to your main power supply. Be sure that the supply is stable and matches the voltage on the label above the socket.
F	Ground	This grounding terminal must be connected to a safe electrical ground if your location does not have a well-grounded 3-prong outlet.
G	Water Pump Socket	This socket connects to your water pump if needed. It is recommended, however, to use a separate plug on a different fuse for it.
H	Exhaust Fan	This fan pulls out gases and airborne debris from the worktable, sending it through the exhaust pipe to a window or air purifier.
I	Water Tubes	The blue line brings cooling water from your pump or chiller to keep your laser tube cool and stable and the white line returns it.
J	Vents	These vents keep components from overheating during prolonged use and should not be obstructed.
K	USB Port	This port connects to your control computer and its engraving software.

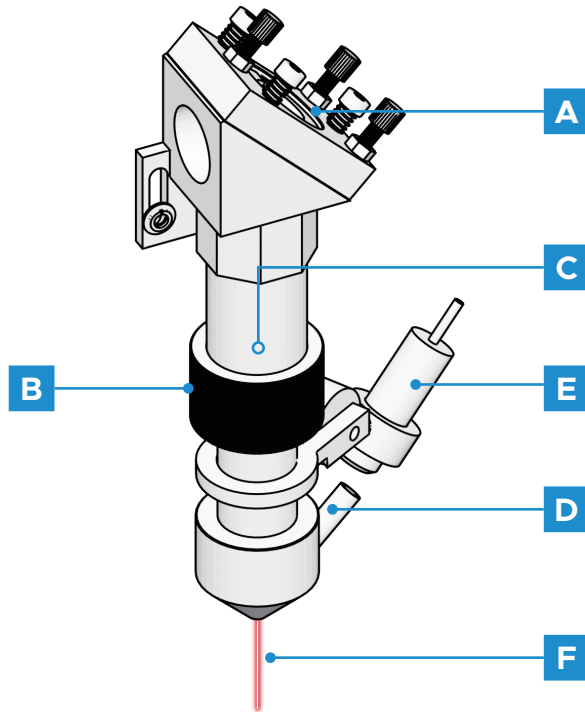
3 Components

3.3 Laser Path



A	Laser Tube	This long glass tube is filled with helium, nitrogen, and CO ₂ gas and cooled water to safely produce a powerful laser. Its connection to the laser power supply is extremely high voltage and extremely dangerous. Although the active laser should be directed into the main bay, its reflections may remain dangerous. Wear laser glasses while the tube is active.
B	1st Mirror	This adjustable-angle mirror is fixed in place to transfer the invisible engraving laser from the laser tube to the 2nd mirror.
C	2nd Mirror	This adjustable-angle mirror transfers the laser from the 1st mirror to the 3rd mirror and moves with the X-axis rail to allow the laser beam to travel along the left Y axis.
D	3rd Mirror	This adjustable-angle mirror transfers the laser from the 2nd mirror to the focus lens and moves with the laser head to allow the laser beam to travel along the X axis.
E	Focus Lens	This lens directs and focuses the laser to its point which contacts with the engraving material. For the best effect, it should be at the correct focal length from the upper surface of the material.
F	X-Axis Rail	The X-axis rail, which holds the 2nd mirror and enables the laser head to move left and right across the workbed, travels along the Y-axis within a range controlled by limit switches.
G	Y-Axis Rails	These rails support the movement of the X-axis rail up and down the workbed.
H	Workbed	The removable workbed provides protection for the debris tray below. The honeycomb bed can be removed to make way for thicker laserable workpiece.

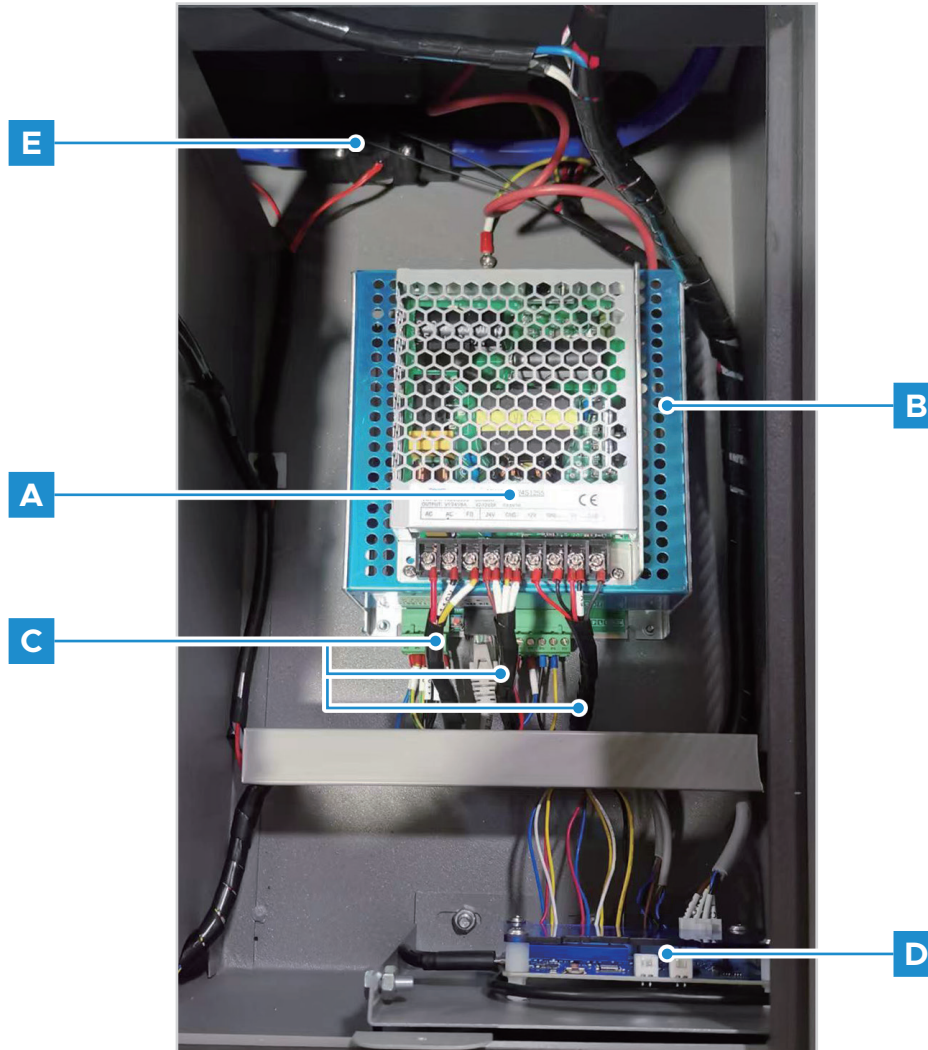
3.4 Laser Heads



A	3rd Mirror	This adjustable-angle mirror transfers the laser from the 2nd mirror to the focus lens and moves with the laser head to allow the laser beam to travel along the X axis.
B	Manual Focusing Knob	This knob can be loosened to allow the laser head to move up or down as needed for manual focus adjustment. Retighten the knob before use.
C	Focus Lens	This lens directs and focuses the laser to its point which contacts with the engraving material. For the best effect, it should be at the correct focal length from the upper surface of the material.
D	Air Assist	This engraver blows pressurized air to kill sparks and blow away dust and debris as you engrave.
E	Red Dot Pointer	This device helps you see the exact position of the invisible engraving laser.
F	Laser	The engraving laser itself is invisible but highly dangerous. Avoid any direct exposure to your skin or eyes.

3 Components

3.5 Electronics Bay



A	Low-voltage Power Supply	This device provides power for low-voltage components such as the mainboard, air pump, and light.
B	Laser Power Supply	This engraver transforms standard electricity into the extremely high voltage necessary for the laser tube.
C	Terminals	These terminal blocks hold your wiring in place for easier part replacement when needed.
D	Mainboard	This circuit board controls the engraving process, responding to commands from your engraving software.
E	Water Sensor	This device (not shown) is attached to the water outlet and provides the reading for the control panel's water temperature gauge.

4 Installation

4.1 Installation Overview

A complete working system consists of the laser engraving machine, its integrated air assist and exhaust system, a water tank (not included) with a pump (included), and a USB cable connected to a control computer with the enclosed engraving software. You can also configure additional accessories (such as an industrial water chiller or rotary axis) to suit your needs.



Use only the hardware, wiring, and power sources that came with or are compatible with this engraver. Installing equipment that your engraver is not designed to work with can lead to poor performance, shortened service time, increased maintenance costs, property damage, and personal injury.

Note the specific requirements of your system's installation. Every customer must understand these notes before installation to execute a proper setup and achieve safe laser performance. If you have any installation questions or problems, contact our technicians and customer support team.

Any auxiliary equipment must be adjusted to the base machine. Queries may be directed to the dealer or manufacturer of such equipment.

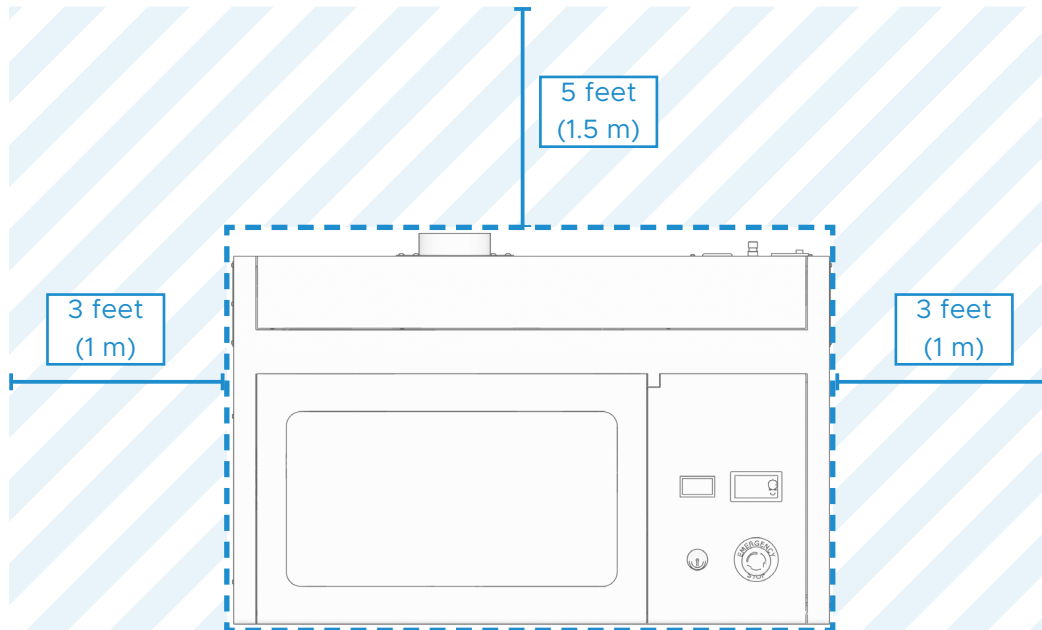
4.2 Selecting a Location

Before you install your engraver, select an appropriate location for its use. Be sure that it meets all of the requirements below:

- Be sure that it meets all of the requirements discussed in [§1 Safety Information](#) on Page 1.
- The location should be stable, level, dry, and climate-controlled to provide an ambient temperature of 40°F–95°F (5°C–35°C) and an ambient humidity under 70%. In particular, the temperature and humidity together should not be close to the dew point. It is also advisable to use a windowless room or to use blinds and/or curtains to avoid exposure to the potential additional heat of direct sunlight.
- The location should be free of dust and other airborne pollutants, and it should be well-ventilated enough to process any fumes produced by the engraving process in accordance with all applicable laws and regulations. Depending on the materials to be processed, this may require the construction of a dedicated ventilation system.
- The location should be away from children; sensitive EMI engravers; and any combustible, flammable, explosive, or corrosive materials. Remove any items that might block the side vents.
- The power cord should be plugged into a compatible and stable power source via a grounded 3-prong outlet. No other item should be drawing current from the same circuit. There should be firefighting equipment nearby and the local fire department's phone number should be clearly displayed.

4 Installation

- It is highly recommended to have an extra work table nearby to avoid placing objects on or directly adjacent to the engraver, which could become a fire or laser hazard.
- Provide 5 feet (1.5 m) of clearance behind the engraver for the fan and 3 feet (1 m) of clearance to the right of the engraver for the electronic bay cooling for maximum efficiency and the left for maintenance.



4.3 Unpacking

Your engraver should have arrived in a cardboard box with its accessories (including this manual) packaged inside. You should place the box in a spacious flat area for unpacking, ideally near where you plan to operate the machine permanently. Use at least two people to move and adjust the engraver's position to help keep it level and avoid any sharp or sudden movement.

1. Open the top of the box, take out the accessories package, and remove the surrounding foam insulation.
2. Carefully remove the other packaging and foam insulation from the sides and set them aside. With at least one other person, use the two straps around the engraver to lift it out of the crate and move it to a sturdy table or countertop.
3. Carefully remove the straps and plastic packaging from around the engraver.
4. Open the cover and take out all the parts.

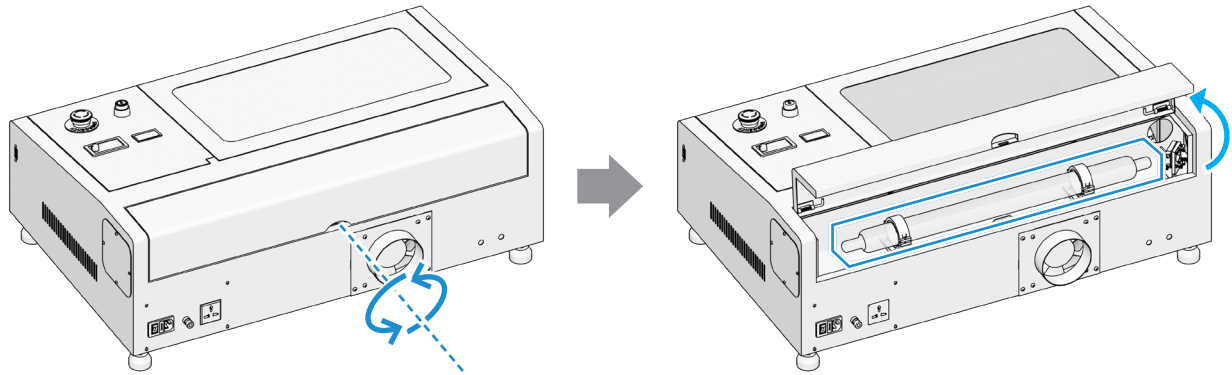
Make sure that you have received all listed accessories in the package list (See [2.4 Package List](#) on Page 11).

5. Carefully remove any remaining interior packaging and stays—including the strap around the laser head—and set them aside.

The laser tube is a highly fragile object and should be handled delicately and as little as possible.

6. Use a hex wrench to unscrew and open the rear cover to check the laser tube for any damage.

The laser tube is a highly fragile object and should be handled delicately and as little as possible.



7. Pull out the debris tray and honeycomb bed.
8. Place the side of the honeycomb with the unit you prefer to use facing up and slide it into place.
The honeycomb bed has inch and metric rulers on opposite sides.
9. Slide the tray back in underneath it.



Never attempt to place or remove the honeycomb bed through the main cover. Always remove it along with the debris tray instead.

You may keep the packaging in case of future return but, if you dispose of it or any accessories, be sure to do so in compliance with applicable waste disposal regulations.

4 Installation

4.4 Installing the Cooling System



- The provided water pump is essential to your engraver's performance and longevity. When this laser works without a properly maintained cooling system, its glass tube **WILL** crack from excess heat.
- Always fill the tank with deionized or distilled water or a custom-purpose laser-safe antifreeze. Using tap water will gradually degrade the quality of your engraver and may even cause dangerous mineral buildup within the cooling system. Never use generic antifreeze for the same reason.



NEVER touch or adjust your engraver's water supply while the pump is connected to power.



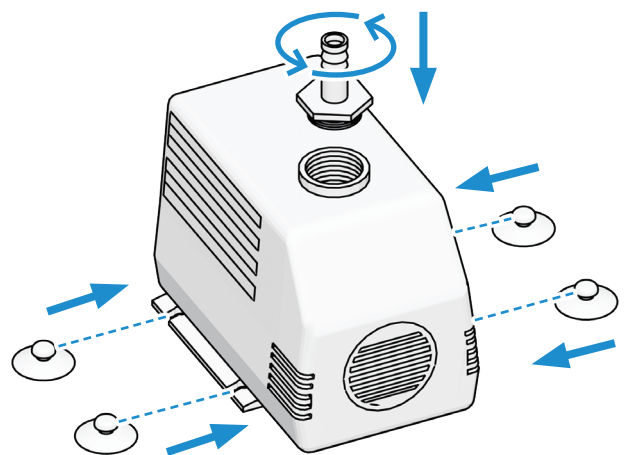
As an alternative to manually adjusting the water in your tank, you can also use an industrial water chiller to provide your engraver with temperature-controlled water. We recommend the CW-3000 9L chiller (not included). If using it with this engraver, follow its separate manual and plug it into an outlet on a separate fuse from the engraver itself.

To connect the water pump to the engraver:

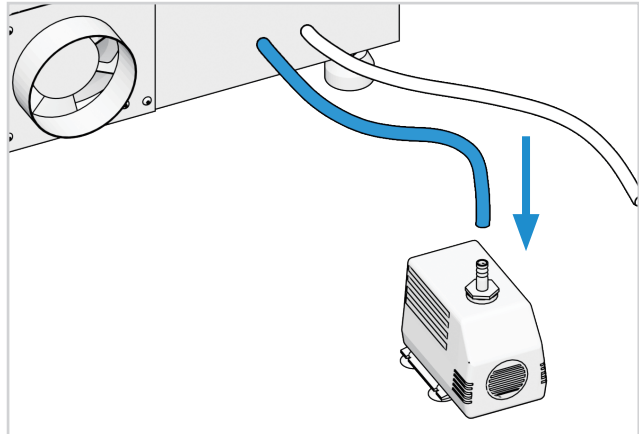
1. Fill a dedicated water tank with distilled water at 15°C–21°C. The tank should always hold at least 2 gallons (7.5 L) of water.

If the temperature drops below 0°C, it is recommended to use laser-safe antifreeze.

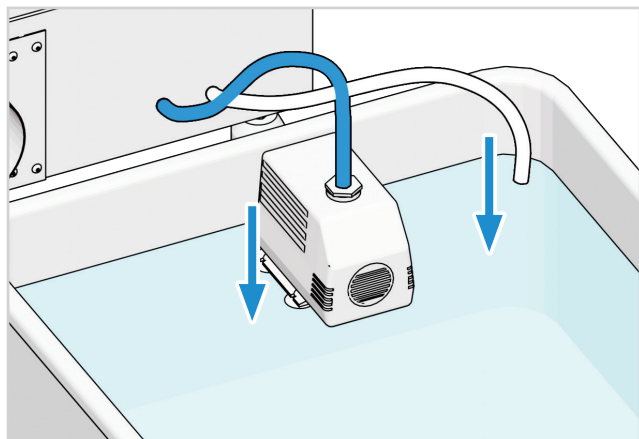
2. Install the four suction cups and tube connector to the water pump.



3. Connect the preinstalled blue Ø12 mm hose on your engraver to the water pump.



4. Completely submerge the pump in the water tank.
5. Place the white Ø12 mm hose into the tank in such a way that the returning water flows into the tank without splashing or other problems.



6. Connect the water pump to its power supply.

For best results, use a power outlet on a separate fuse from the engraver itself. If no such outlet is available, the pump can also be plugged into the dedicated socket located on the back of the engraver.

Once the plug is plugged in, water should begin to run through your machine and back into your tank. When the water cooling system is in operation, pay attention to the following:

- **ALWAYS** obtain visual confirmation that the water flows through the laser tube before starting your laser.
- Larger bubbles will pose a risk of overheating the laser tube. **ENSURE** there are no air bubbles larger than 1 cm. If there are larger bubbles, check the water level in the water tank to fully cover the water pump. You can tilt the engraver on the left side until the bubbles dissipate.
- **NEVER** allow the water in the tank to become too hot to cool the laser. Heat damage can occur quickly and severely shorten the life of the laser tube.

Periodically check the water's temperature on the built-in digital display. For best results, keep it between 60°F–70°F (15 ° C–21 ° C). If the water begins to come near 100°F (38 ° C), replace it with cooler water. Either replace it in stages or turn off the laser during this process: never allow the laser to operate without a constant flow of cooling water. It is also possible to add sealed bottles of frozen water to your tank to keep the water cool but never allow the water to become ice cold, as this could shatter the heated glass CO₂ tube as well.

4 Installation

7. Unplug the water pump after confirmation.

As an alternative to manually adjusting the water in your tank, you can also use an industrial water chiller to provide your engraver with temperature-controlled water. We recommend the CW-3000 9L chiller (not included). If using it with this engraver, follow its separate manual and plug it into an outlet on a separate fuse from the engraver itself.

4.5 Installing the Exhaust System

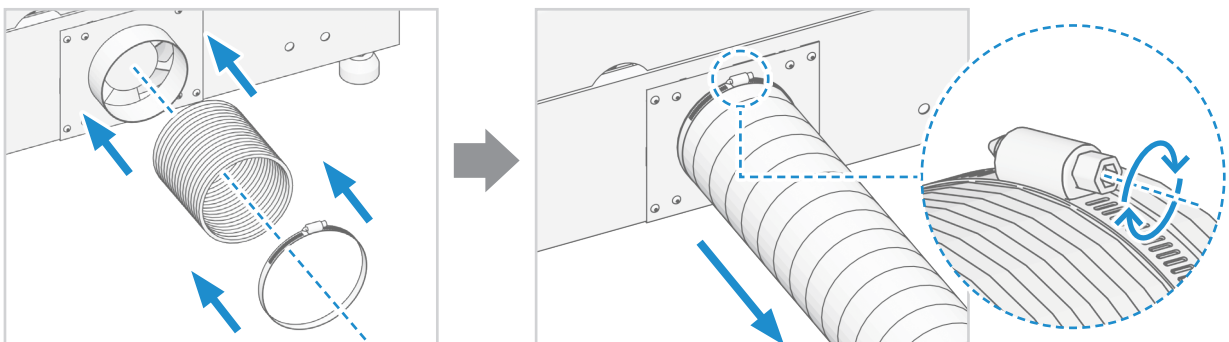


Wear work gloves to avoid cuts.

The provided exhaust pipe extends to a total length of 16' 4" (5 m). Plan out the route that they will take from your engraver's fan to a dedicated purifier or—if your engraving fumes and debris will not be hazardous and meet local and national air safety standards—to any window or exterior vent. Generally speaking, the straighter you can keep the pipes between your engraver and their outlet, the better your system's ventilation will be and the less quickly dust and debris will build up within the pipes over time.

To install the duct fan:

1. Slide the hose clamp onto one end of the exhaust pipe. Use it to firmly connect the engraver's exhaust vent and the pipe.
2. Place the other end of the hose out a door, window, and so on, or—if there will be any harmful byproducts produced as you engrave—connect the pipe to a dedicated fume extractor.
3. Seal all seams and connections tightly.



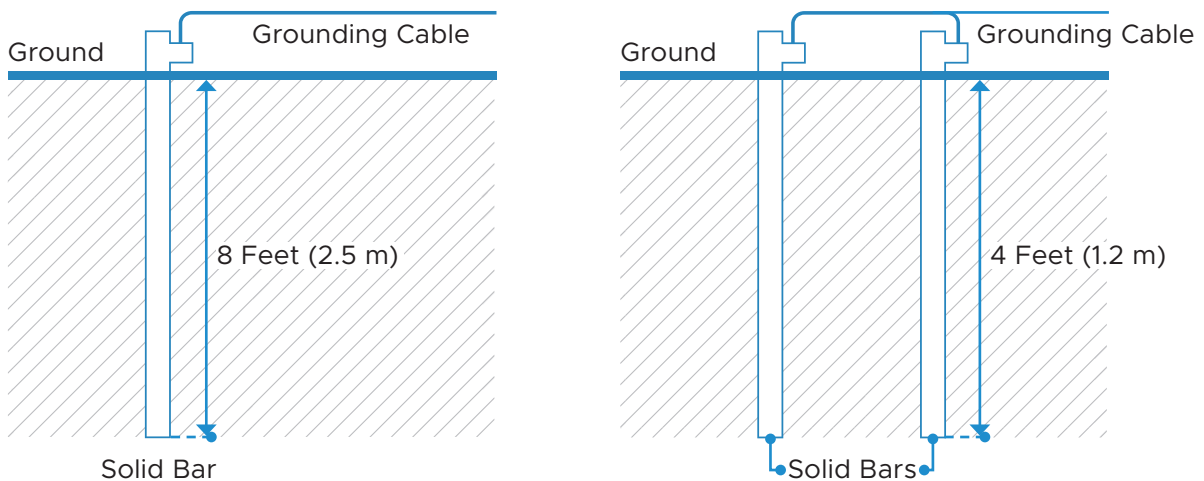
NEVER operate the laser if the exhaust system is not removing the fumes and dust produced by your materials out of your work area. Always research materials before use and never operate the laser on any (such as PVC, Teflon, and other halogen-containing substances) that can produce corrosive, hazardous, or even deadly fumes.

4.6 Setting Up the Control System

1. Confirm that the labeling beside the power socket at the back of the engraver matches your local power supply and that the power switch is in the **●** position before setting up the control system.
2. Connect one end of the power cable to the power socket.
3. Plug the other end of the power cable into a grounded 3-prong outlet or into a surge protector rated over 2000 J that is itself connected to a grounded outlet. Use a dedicated circuit with no other devices on it.

If the outlet is not grounded, use the grounding cable and connect it as follows:

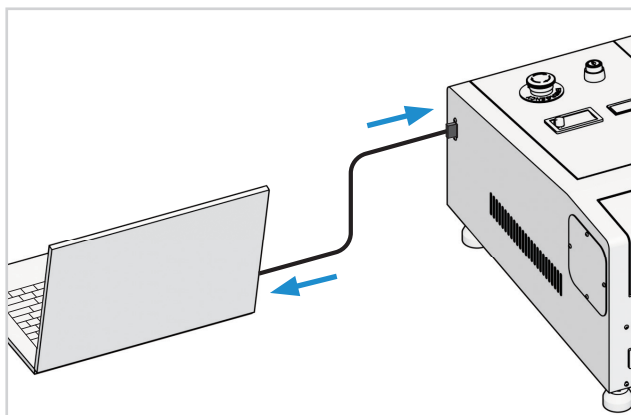
- a. Fasten the near end of the grounding cable to the ground port at the back of the engraver.
- b. Connect the far end of the cable to a single metal rod driven at least 8 feet (2.5 m) deep or to two separate metal rods driven at least 4 feet (1.2 m) deep into soil located at least 5 feet (1.5 m) from the machine.



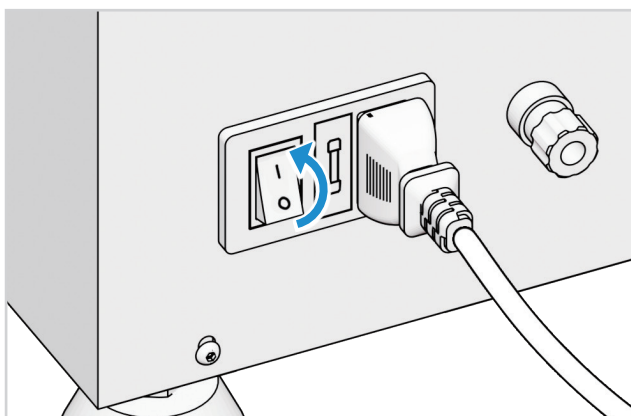
- Fluctuation along the circuit line should be less than 5%. If this is exceeded, the fuse will blow, which is located in the power socket and accessible from the exterior.
- Do not connect this device to standard extension cords or power strips.
- The powerful laser is extremely high voltage and potentially dangerous, so users must securely ground the engraver to avoid the buildup of static electricity.
- Poor grounding **WILL** cause equipment failure and create a serious electrical shock hazard. The manufacturer and/or seller bear(s) no responsibility and assume(s) no liability for any damage, accidents, or injuries caused by bad grounding connections.

4 Installation

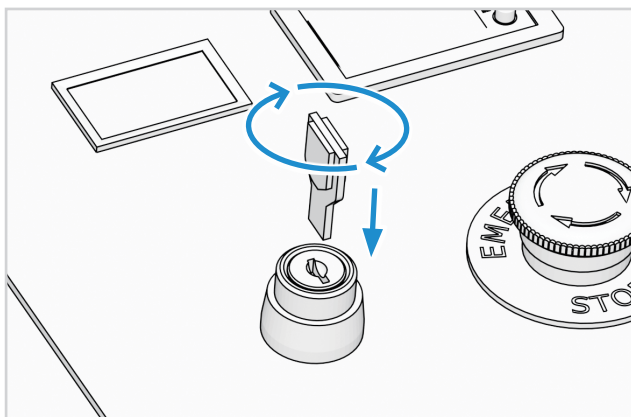
4. Connect the engraver to your computer using the provided USB cable via the USB port.



5. Press the power switch to I.



6. Insert and turn the laser key clockwise.



4.7 Setting Up the Software

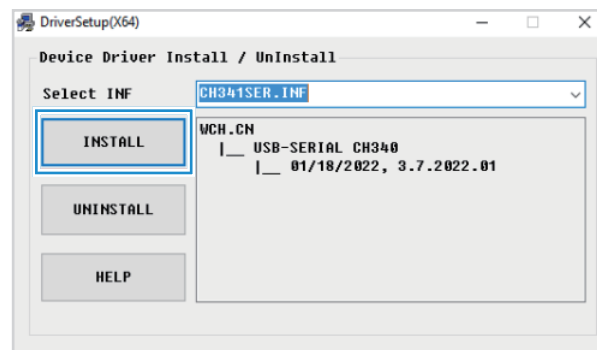
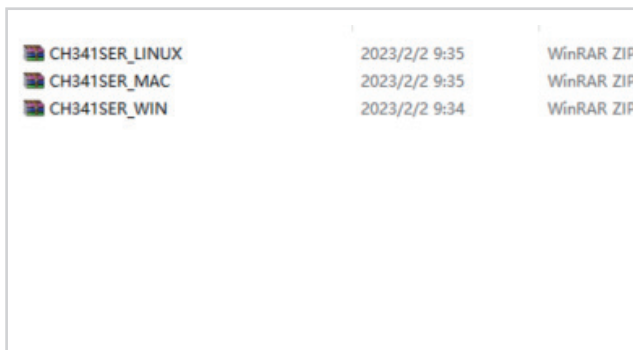
4.7.1 Installing the Software

The software, driver, and software user manual are provided in the USB flash drive.

1. Make sure the computer has been connected to the engraver using the provided USB cable.

If a longer cable is to be used, make sure that it is no longer than 15 feet (4.5 m) to avoid possible interference with signals on the line.

2. Insert the provided USB flash drive into the USB port on your control computer. Copy the contents to the computer's hard drive.
3. Confirm that the control computer meets the requirements in the software manual. Replace the computer as needed.
4. Extract and install the version of the CH341 driver that matches your computer's operating system.



5. Extract and install LaserGRBL from the same flash drive.

You can check for the latest version of LaserGRBL from its official website at lasergrbl.com. For LightBurn and other compatible 3rd party software, contact our customer service, visit the OMTech website, or see our YouTube channel.

The next step involves configuring the software. We provide guidance for LaserGRBL and LightBurn exclusively. For other engraving software, follow the respective manual to configure the software for your new engraver. If you encounter any issues, contact our customer service for help.

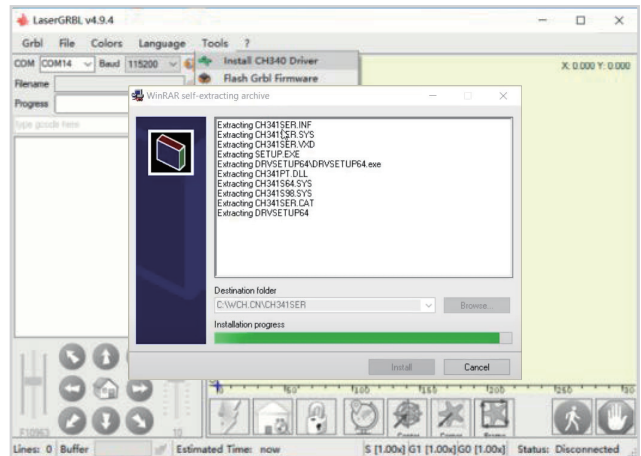
4 Installation

4.7.2 Configuring the LaserGRBL

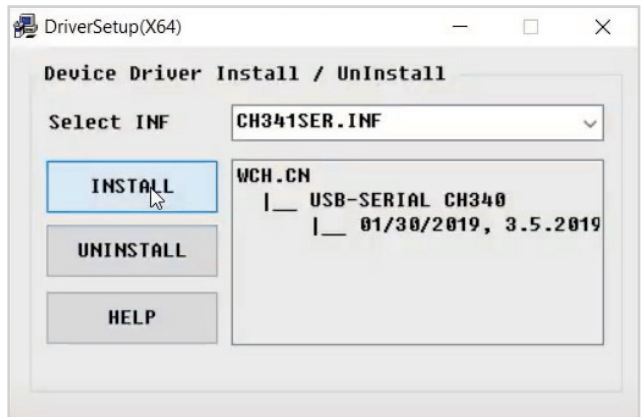
The configurations provided here are only for LaserGRBL users. If you opt to switch from LaserGRBL to Lightburn after installation, reset all personalized settings in LaserGRBL back to their default values, otherwise, interference may occur.

To configure the LaserGRBL software:

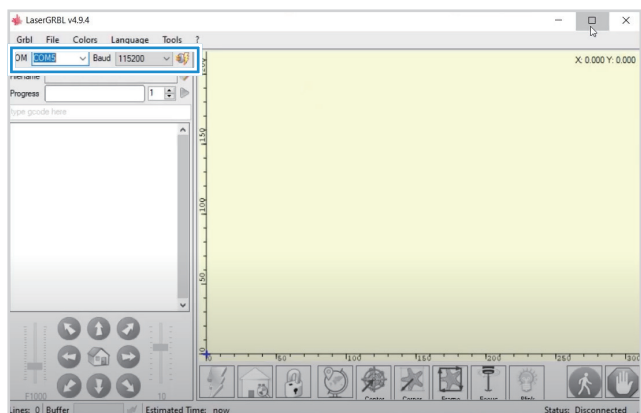
1. Open the LaserGRBL software on your computer.
2. Select **Tools** → **Install CH340 Driver**.



3. Click **INSTALL**.

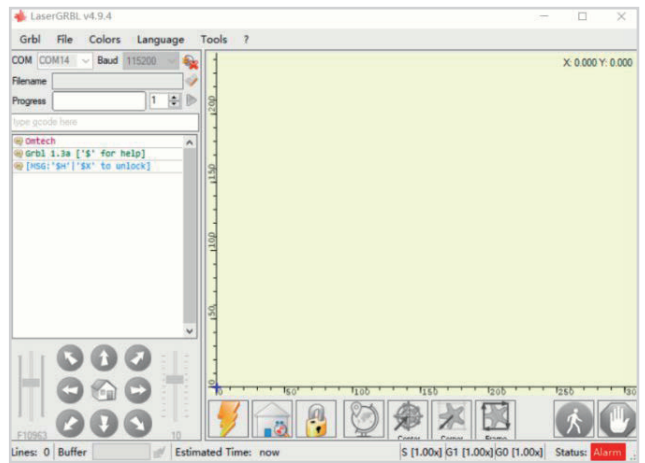
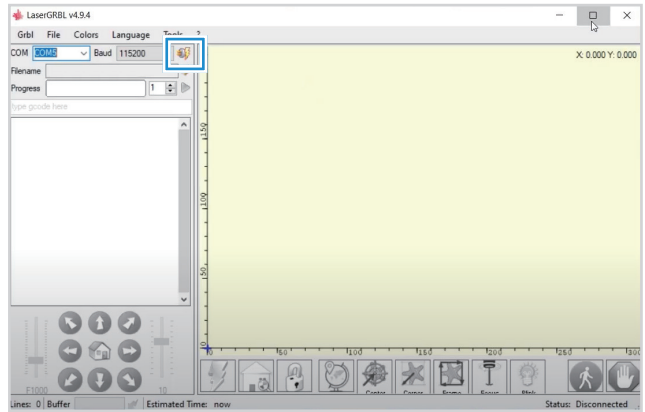


4. Once the driver is installed, choose the COM port and set the **Baud** rate to **115200**.



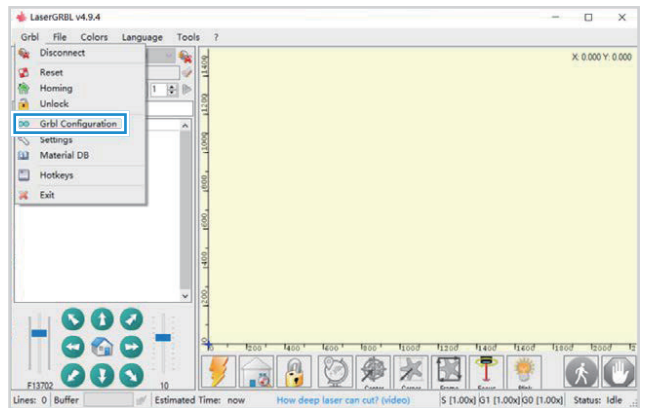
5. Click **Connect** to connect to the engraver.

The status will change from **Disconnected** to **Idle** at the bottom right corner after your engraver has successfully connected.



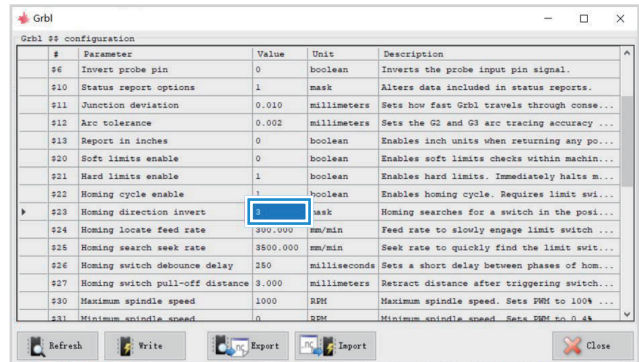
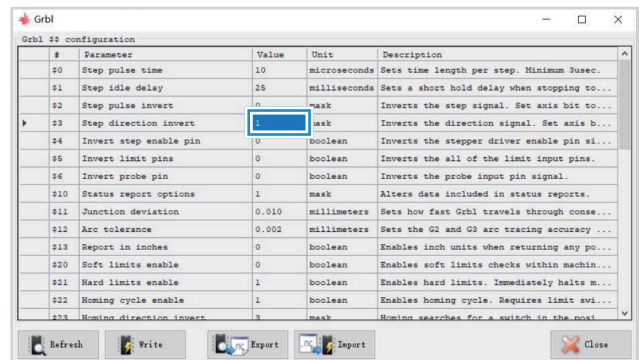
6. Click **Grbl** → **Grbl Configuration**.

The **Grbl** configuration menu should be popped up.

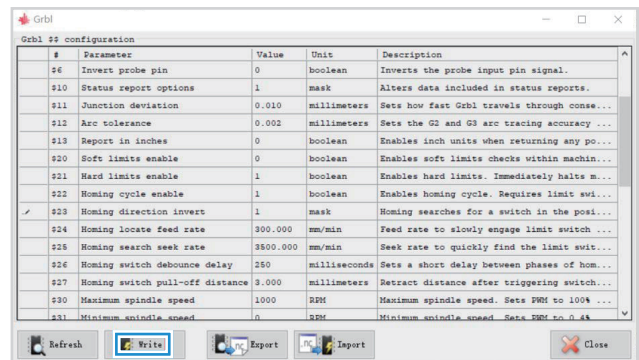


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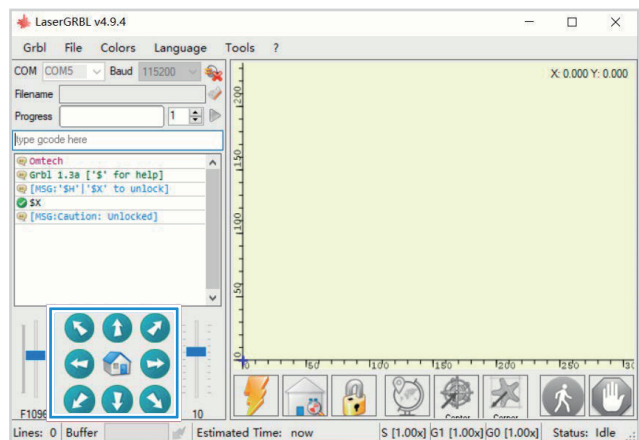
- In the configuration menu, change **Step Direction Invert** (Item **\$3**) from **1** to **3** and **Homing Direction Invert** (Item **\$23**) from **3** to **1**.



- Click **Write** to save the changes and then click **Close** to close the menu.



- To enable the move menu, type the command "\$X" into the GCode field and press **Enter**.



- Now the software is correctly configured for your engraver. Familiarize yourself with your software's image design and laser control features before using them to operate the laser.

For details on operating the LaserGRBL software, refer to the provided user manual.

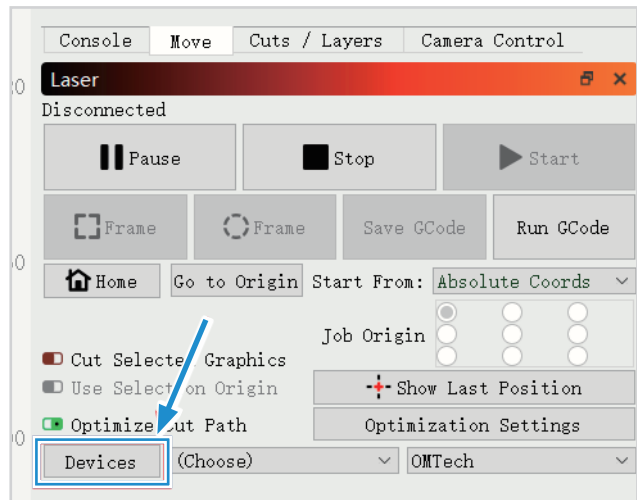


4.7.3 Configuring the LightBurn

The configurations provided here are only for LightBurn users. If you opt to switch from LightBurn to LaserGRBL after installation, reset all personalized settings in LightBurn back to their default values, otherwise interference may occur.

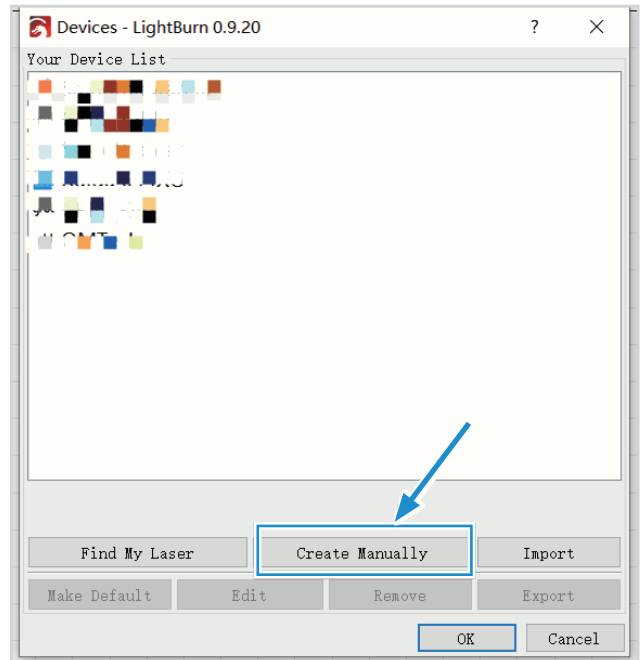
To configure the LightBurn software:

- Open your LightBurn software and click **Devices**.

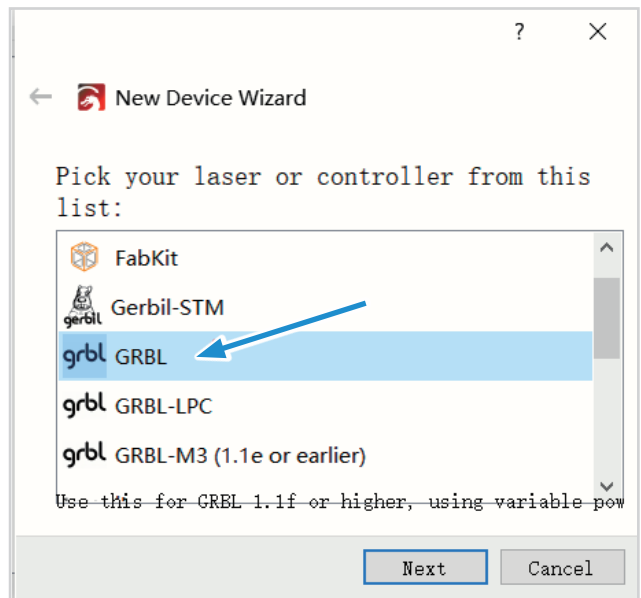


4 Installation

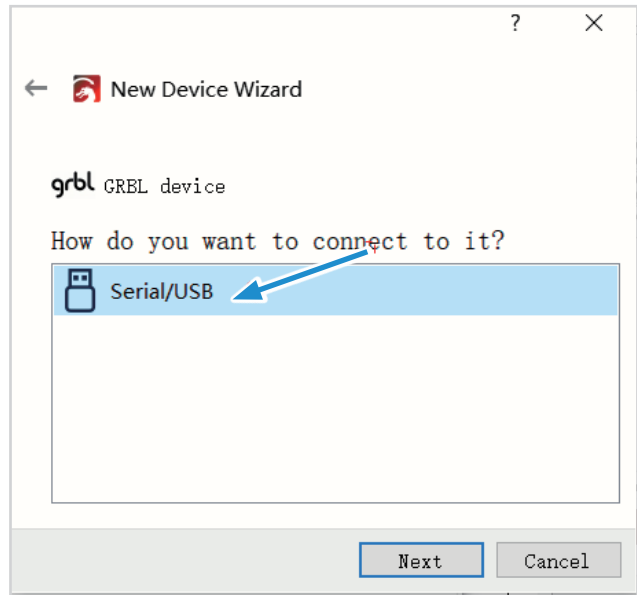
2. Click **Create Manually**.



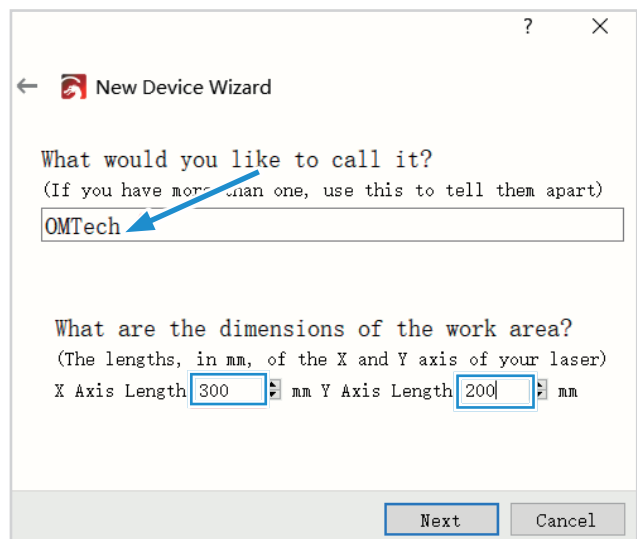
3. Select **GRBL** and click **Next**.



4. Select **Serial/USB** and click **Next**.



5. Name the laser and set its X-axis length to **300** mm and its Y-axis length to **200** mm.

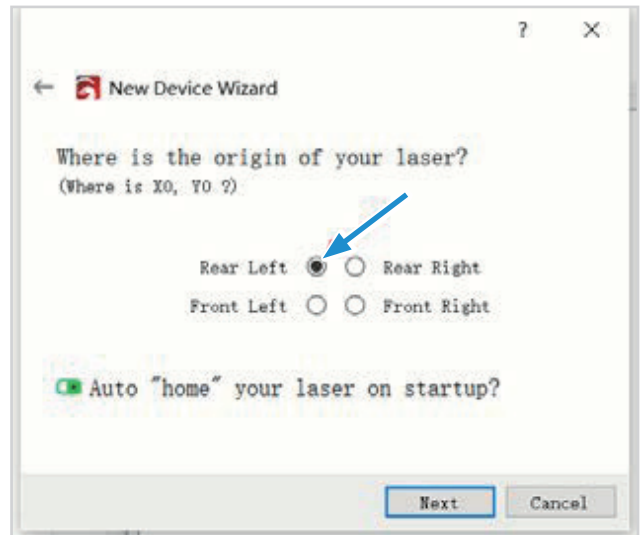


4 Installation

6. Choose a corner to use as the machine's origin point and click **Next**.



Choosing an origin that differs from the one in your design files can result in mirrored output or direct the laser beam outside the intended area, leading to dangerous reflections.



7. Confirm that your setup is correct and then click **Finish**.



8. Now the software is correctly configured for your engraver. Familiarize yourself with your software's image design and laser control features before using them to operate the laser.

5 Initial Testing



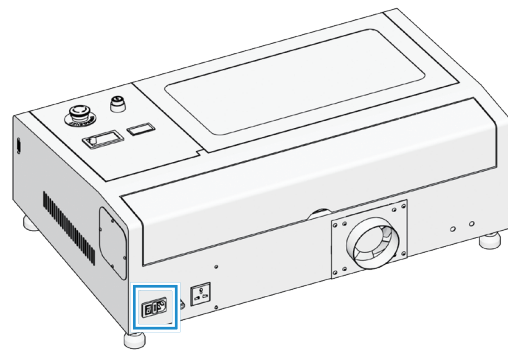
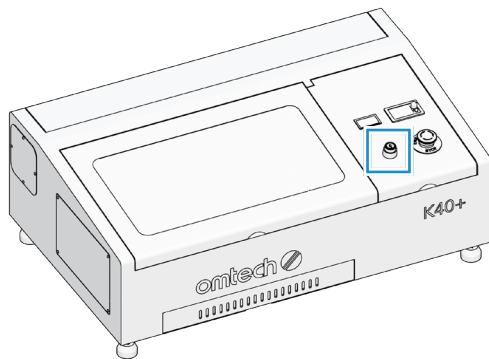
Wear safety glasses during the entire test process!



Always make sure the path is clear between the laser and its target.

Never allow foreign objects between the laser and the material being engraved. Take care not to leave any part of your body in the laser path when it is in operation.

For your safety and that of passersby, this engraver requires two switches to provide power to the laser tube, the front laser key and the rear power switch.



Operators should **ALWAYS** disable at least one of these switches between uses to prevent unauthorized operation of the machine. Only leave them in place if the work area itself is completely secure and inaccessible to any children.

5 Initial Testing

5.1 Emergency Shutoff

In case of the risk of fire and other hazards during engraving, this engraver includes an easy-to-reach **Emergency Stop** button. Pressing it down stops the laser tube instantly; turning it clockwise unlocks it. When your engraver arrives, its **Emergency Stop** button is initially pressed. It must be unlocked before use.

You should test that it works properly before conducting **ANY** other work with your machine.

1. Turn on the water cooling system.


Confirm that the cooling system has been activated.

2. Press the power switch to **I** to turn on the engraver.
3. Place a piece of laserable scrap material onto the workbed and then close the cover.
4. Turn the **Emergency Stop** button clockwise to unlock it.

Confirm that the air assist and exhaust fan have been activated.

5. Insert and turn the laser key.

The display panel should light up.

6. Fire the laser by clicking  in your software.
7. Hit the **Emergency Stop** button and observe whether the engraver powers down and the laser stops instantly.

If the laser continues to fire, the **Emergency Stop** is not working and must be replaced before the engraver can be used. Turn off the machine and contact customer service.

8. Turn off the engraver after the test is done.
 - a. Turn the laser key counterclockwise.
 - b. Press the power switch to **O**.
 - c. Make sure the **Emergency Stop** button is locked.

5.2 Interlock

Because of the risk of blindness, burns, and other injuries from direct exposure to the invisible engraving beam, this device shuts off the laser automatically when any one of its protective interlocks is triggered.



Always make sure the path is clear between the laser and its target.

Never allow foreign objects between the laser and the material being engraved. Take care not to leave any part of your body in the laser path when it is in operation.

5.2.1 Cover Shutoff

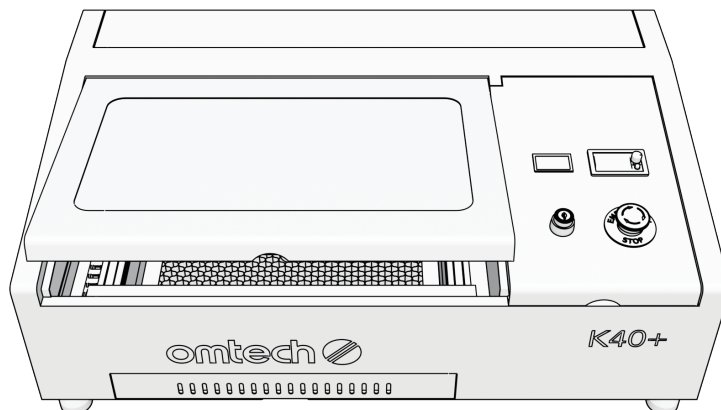
You should test that this engraver also shuts off the laser automatically when the protective cover is raised during operation.

You should test that the cover shutoffs activate properly before conducting any other work on your machine.

1. Perform the same procedure as before but, instead of hitting the **Emergency Stop** button, open the cover.

The water protection signal on the display plane should be **OFF**.

The laser should pause automatically. If the laser continues to engrave the design while the cover is raised, the automatic shutoffs are not working and must be repaired before the engraver can be used. Turn off the machine and contact our technical support team.



2. Turn off the engraver after the test is done.

5 Initial Testing

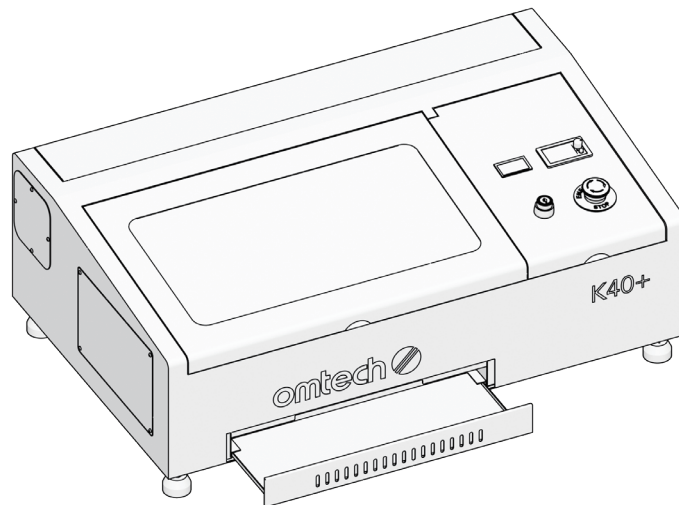
5.2.2 Tray Shutoff

After ensuring that the cover shutoff works, you should also test that the tray shutoff activates.

1. Perform the same procedure as before but, instead of opening the cover, open the debris tray.

The water protection signal on the display plane should be **OFF**.

The laser should stop completely. If it continues to engrave the design while the debris tray is open, the automatic shutoff is not working and must be repaired before the engraver can be used. Turn off the machine and contact our technical support team.



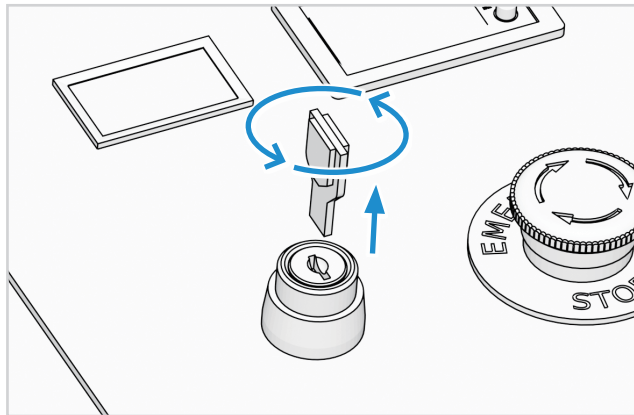
2. Turn off the machine after the test is done.

5.3 Laser Key Shutoff

After ensuring that the interlocks work properly, you should test that the laser key functions correctly.

1. Perform the same procedure as before but, instead of opening the cover or tray, turn and remove the laser key.

The laser should stop completely. If it continues to engrave the design without the key in place, the automatic shutoff is not working and must be repaired before the engraver can be used. Turn off the machine and contact our technical support team.



2. Turn off the engraver after the test is done.

5 Initial Testing

5.4 Water Shutoff

Because of the danger posed by an uncooled laser tube, this engraver also shuts off the laser automatically when its sensors do not detect the correct water flow. You should test that the water shutoff functions correctly.



Always make sure the path is clear between the laser and its target.

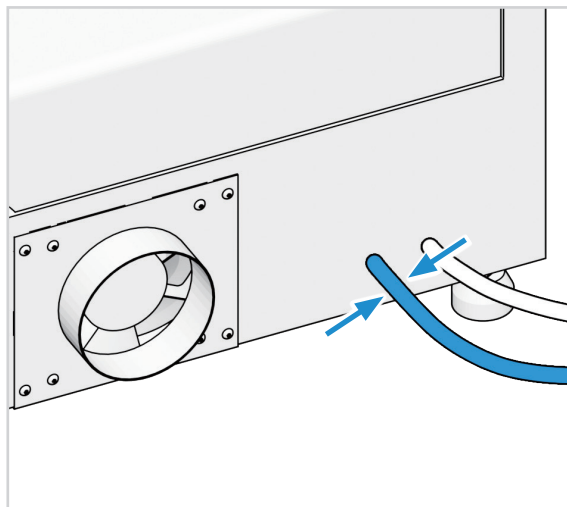
Never allow foreign objects between the laser and the material being engraved. Take care not to leave any part of your body in the laser path when it is in operation.

1. Perform the same procedure as before but, crimp or tie the water hoses, or unplug the water pump.

Be careful not to damage the hoses themselves and to only briefly activate the laser.

The water protection signal on the display plane should be **OFF**. The laser should stop completely.

- If the laser continues to fire, the automatic shutoff is not working and must be repaired before the engraver can be used. Turn off the machine and contact our technical support team.
- If the laser stops completely, the automatic shutoff is working correctly. Release the two hoses and run the water system for a minute or two, checking that no damage or leaks have occurred.



2. Turn off the engraver after the test is done.

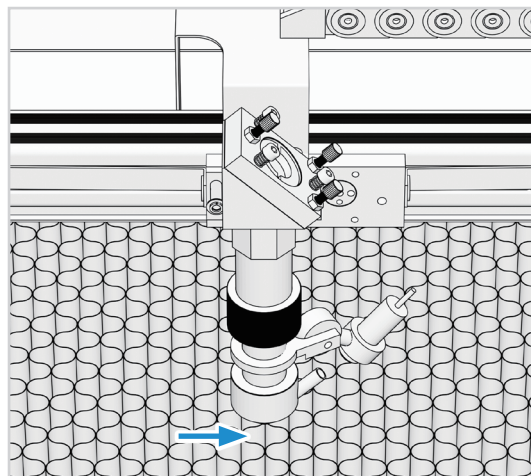
5.5 Air Assist

Because of the danger posed by sparks during engraving and the risk of damage to the laser nozzle and focus lenses from fumes and debris, the pressurized air begins to blow from the laser head when the engraver starts engraving.

You should test that the pressurized air blows correctly:

1. Press the power switch to **I** to turn on the engraver.
2. Turn the **Emergency Stop** button clockwise to unlock it.
3. Open the cover.
4. Place your finger below the laser head nozzle to confirm that pressurized air begins to blow from the laser head.

If it does not, turn off the machine and contact customer service.



5. Turn off the engraver and press the **Emergency Stop** button after the test is done.



If any tubing or wiring needs to be adjusted or reconnected, turn off the machine and disconnect it from power before making any such adjustment.

6 Operation



Operate this laser engraver only in accordance with all the instructions provided in this manual.

Failure to follow these instructions can result in property damage and personal injury.

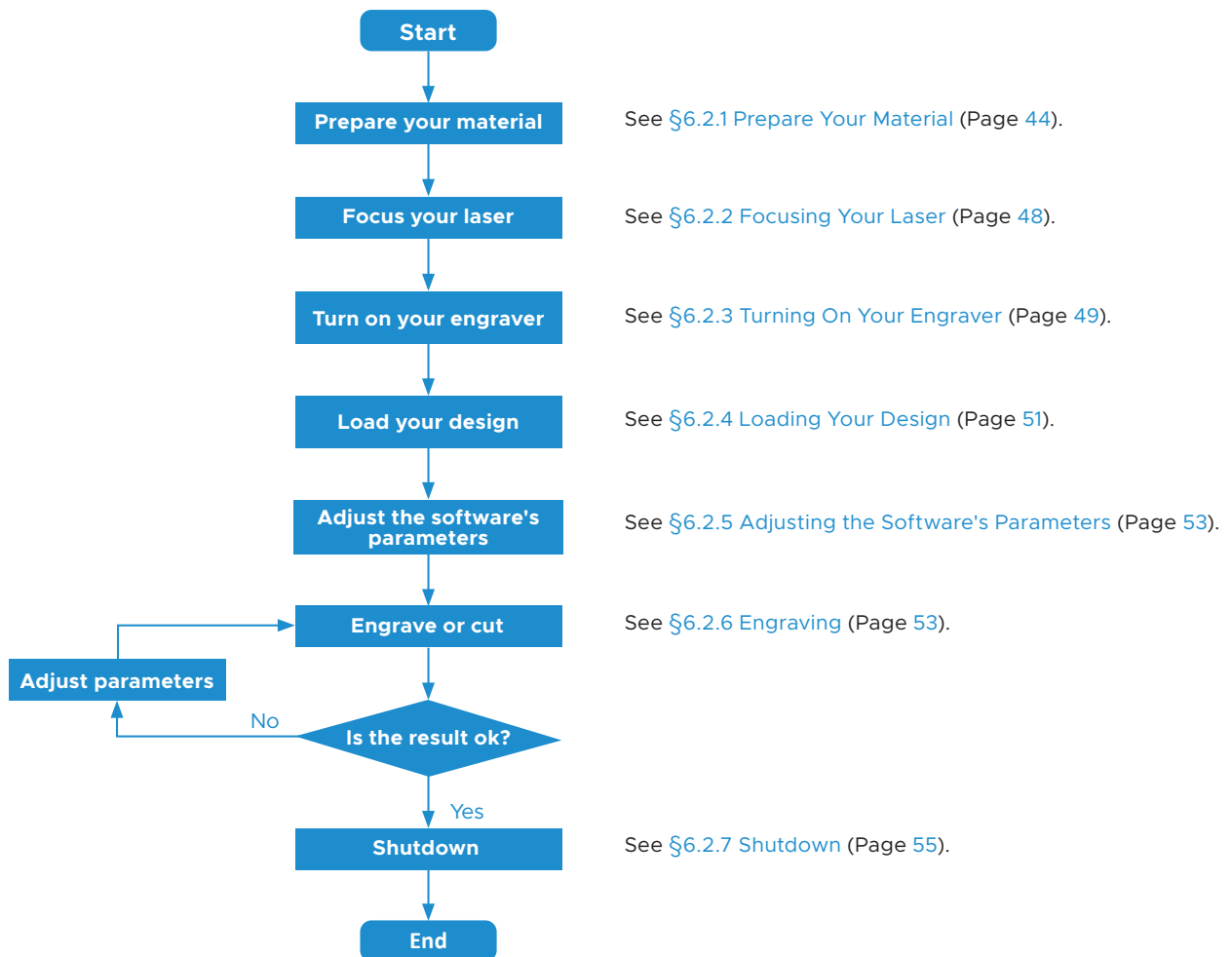


Wear safety glasses during the entire test process!

6.1 Operation Overview

This section will address only some of the options and features provided by the operation software. Before beginning to use the machine, make sure that you have read this entire manual (particularly [1 Safety Information](#) on Page 1), the separate software manual, and any warnings provided on the machine itself.

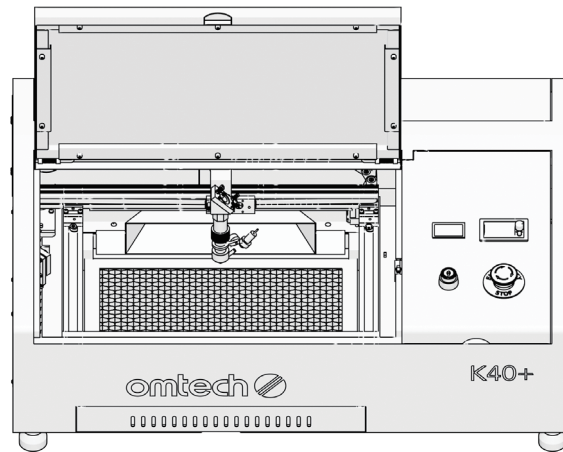
Here are the main operation steps:



6.2 General Operation

6.2.1 Preparing Your Material

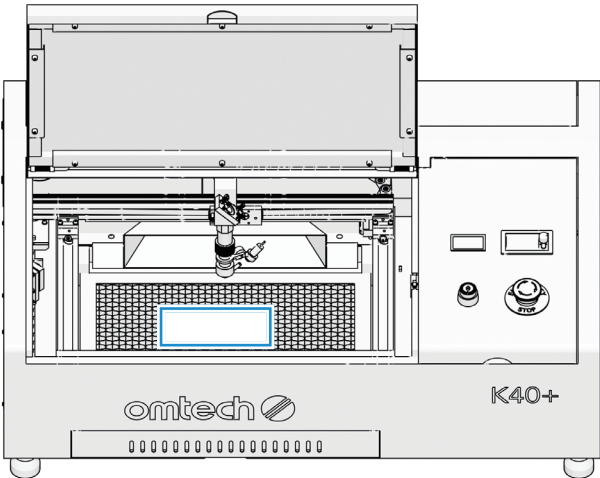
1. Open the cover.



2. Place a sample piece into the main bay following the instructions below. If working with a new material, first check that it can withstand the heat of the laser and will not release harmful fumes when processed.

The standard location is in the top left corner of the workbed. This can be changed by moving either your design or the origin position in your software.

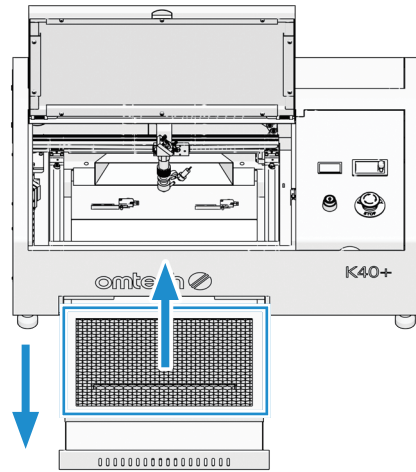
The material should be no longer than 11.8 inches (300 mm):

Thickness	Instructions
$\leq 25 \text{ mm}$	<p>Directly put the sample piece on the honeycomb workbed.</p>  A technical line drawing of the Omttech K40+ laser cutter, similar to the one above. In this diagram, a rectangular sample piece is placed on the honeycomb workbed. The sample piece is highlighted with a blue border. The Omttech logo and 'K40+' model number are visible on the front of the machine.

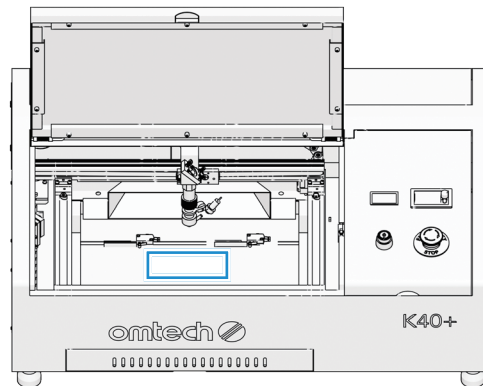
6 Operation

25 mm–60mm

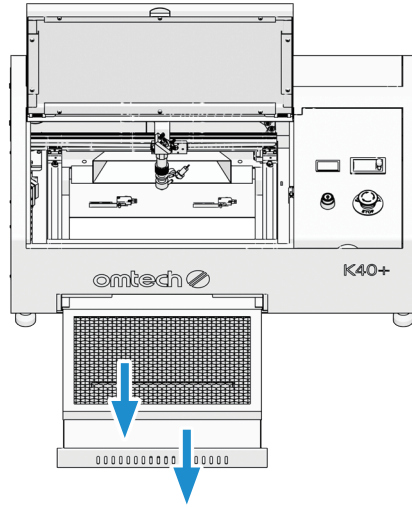
1. Open the tray, remove the honeycomb workbed, and then close the tray.



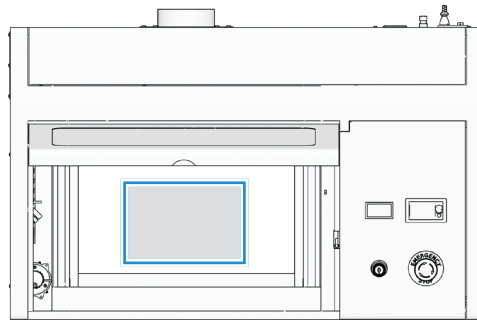
2. Put the sample piece on the tray.



1. Remove the tray and honeycomb workbed.



2. Cover the exposed area of your table with a non-reflective plank, preferably an MDF that fits the space.

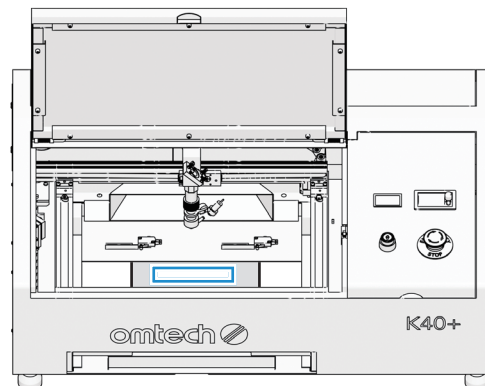


> 60 mm



Warning! Failure to totally cover your table may cause a fire hazard. Using reflective surfaces risks reflecting the laser beam and destroying your engraver.

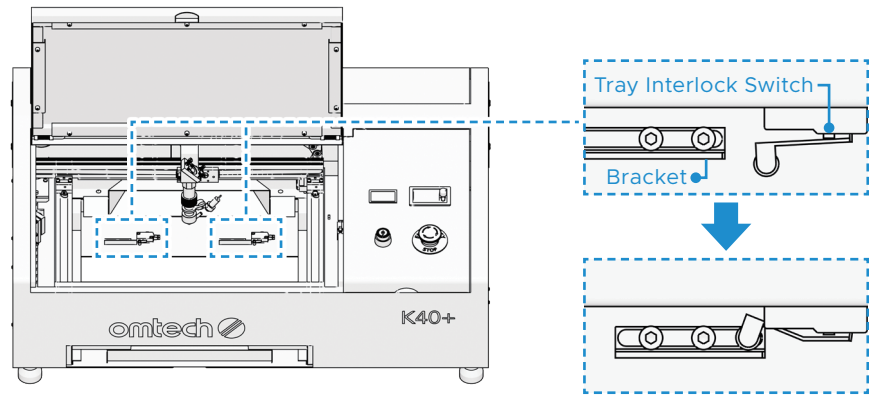
3. Put the sample piece on the plank.



6 Operation

> 60 mm

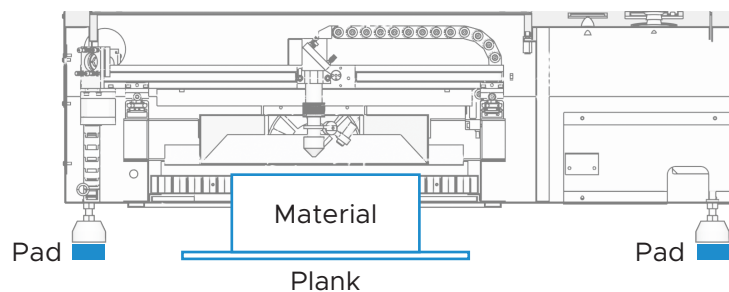
- Slide the X-axis rail forward to expose the tray interlock switch.
- Move the tray interlock switches into a closed position and hold it there by sliding the nearby metal bracket to the right.



Never leave the switch in this position after completing your work. Reenable the switch before leaving the work area.

- Use 4 identical pads at each corner to elevate the engraver. Make sure the height of the pad complies with the following formula:

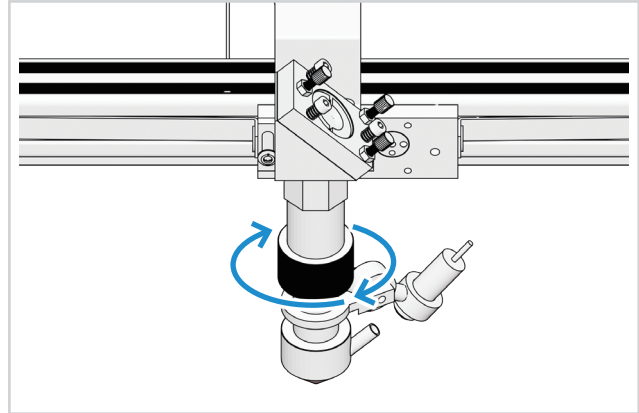
Minimum height of the pad = Thickness of the material beyond 60 mm + Height of the non-reflective plank



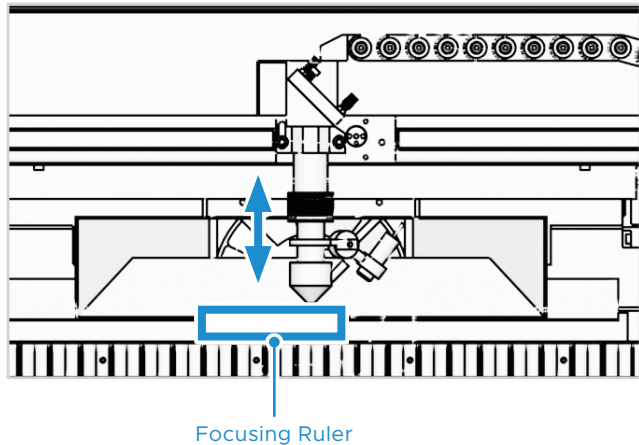
For round pieces, you will need to use a rotary axis. For instructions, see [§6.3 Instructions for Rotary Operation](#) on Page 58.

6.2.2 Focusing Your Laser

1. Move the laser head above the material.
2. Loosen the locking screw on the laser head.

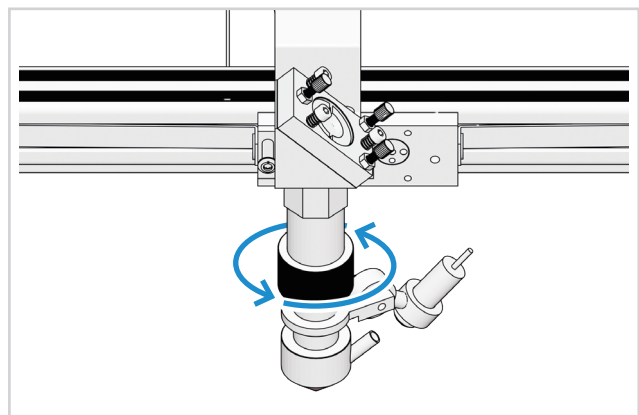


3. Place the focusing ruler between the material and the laser head nozzle.
4. Manually adjust the height of the laser head to make the nozzle touch the top surface of the focusing ruler.



AVOID overextending the laser head downward as this can compromise the precision of the laser path. If the material is too thin, place a non-reflective board beneath it to maintain the proper distance between the nozzle and the material.

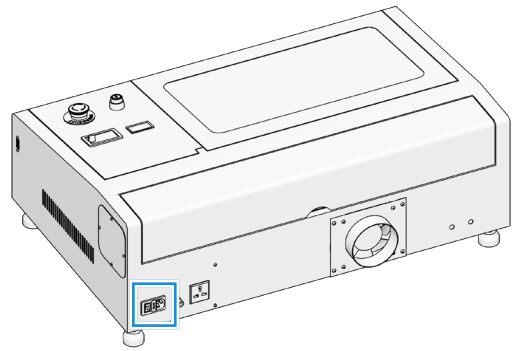
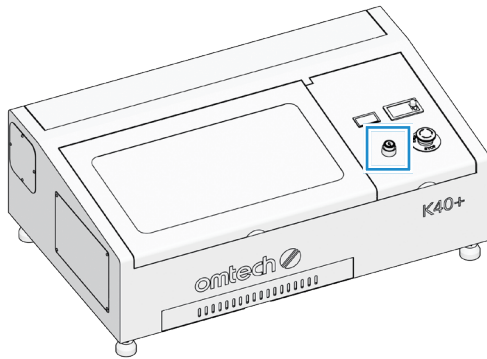
5. Fasten the locking screw on the laser head and close the cover.



6 Operation

6.2.3 Turning On Your Engraver

For your safety and that of passersby, this engraver requires two switches to provide power to the laser tube, the front laser key) and the rear power switch.



Operators should **ALWAYS** disable at least one of these switches between uses to prevent unauthorized operation of the machine. Only leave them in place if the work area itself is completely secure and inaccessible to any children.

1. Check that your water tank is full of clean and cool but not cold distilled water.

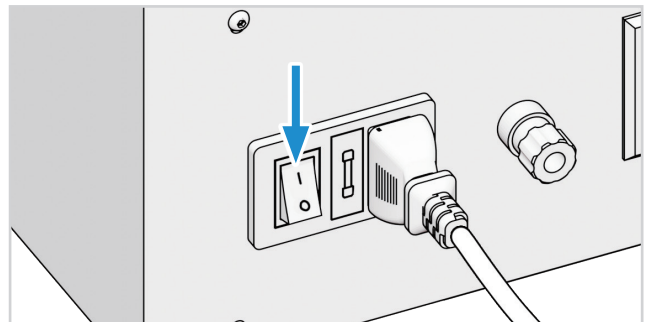
Replace the water if it is not clean or cool. Add more water if it is not completely covering the water pump.

2. If the water pump is plugged into a power outlet not the socket at the back of the engraver, turn on the power supply of the water pump.

Visually confirm that the water is flowing through the whole system either by opening the top rear door to look at the laser tube itself or by observing that water is entering the machine and returning to the tank through the outlet tube. If the laser tube is examined directly, remember to close its access door before continuing.

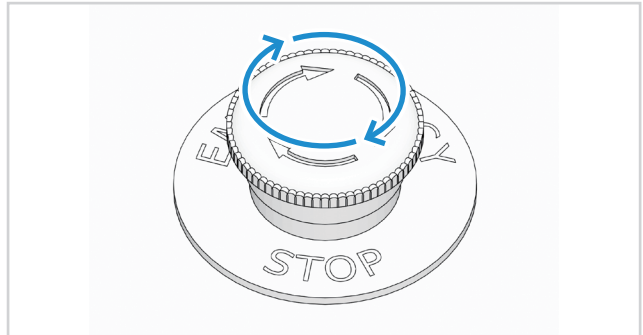
Add more distilled water if the pump is no longer well covered after filling the engraver's water tubing.

3. Press the power switch to I to turn on the engraver.



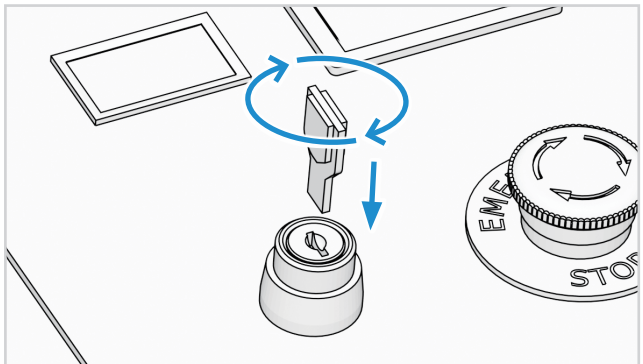
4. Turn the **Emergency Stop** button clockwise to unlock it.

Confirm that the air assist and exhaust fan have been activated.



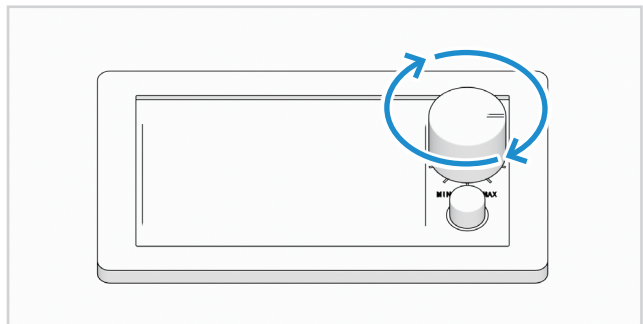
5. Insert and turn the laser key.

The display panel should light up.



6. Check the built-in digital display to ensure that the water's temperature is at an acceptable level.

7. Turn the ammeter knob clockwise to its maximum setting.



8. Confirm that the cooling system, air assist, exhaust fan, and internal lights have been activated.



Put on your protective laser glasses and any other PPE necessary for your material.

6 Operation


6.2.4 Loading Your Design

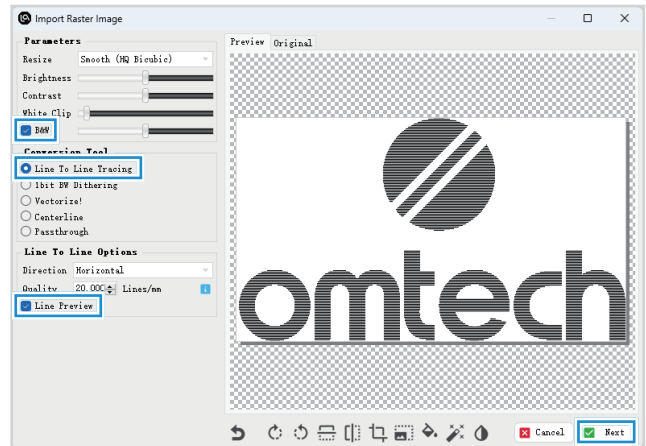
1. Confirm that your control computer has a connection to the engraver via the USB cable.
2. Click **File** → **Open File** to import your design into your engraving software.

you can create a design using any graphics program, saving or converting the file to a format compatible with the engraver. See the full list of acceptable file types in the Technical Specifications section above.

3. If you have loaded a design to engrave, set parameters as follows.

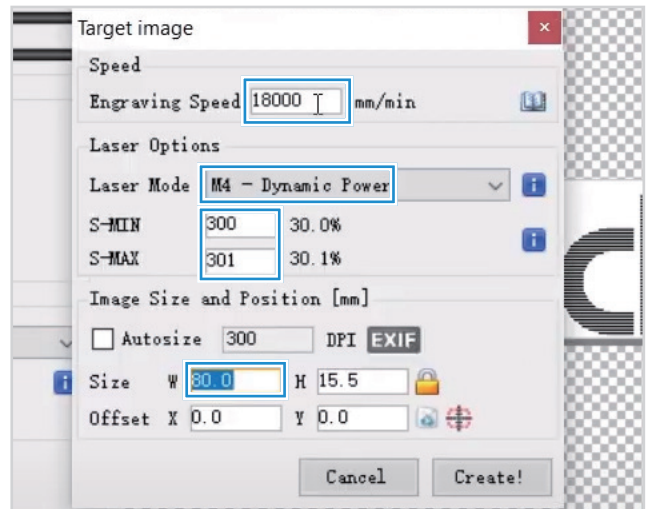
- a. In the popped-up **Import Raster Image** window, check **B&W**, **Line To Line Tracing**, and **Line Preview**, then click **Next**.

You can click the rotate button  if the engraving forms a mirror image of the displayed design.



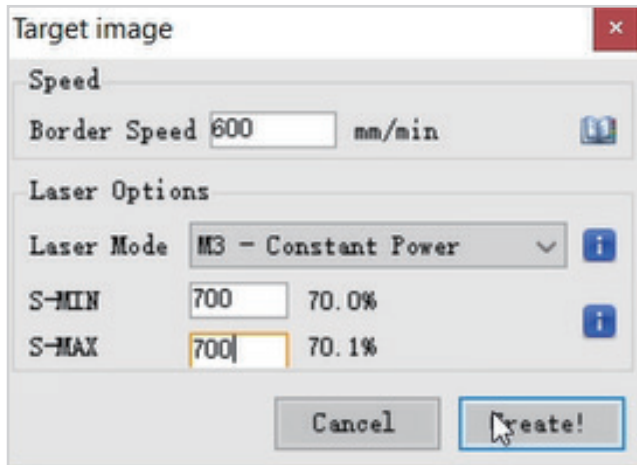
- b. Set the parameters in **Target image** window.

- Engraving speed: 18000
- Laser Mode: M4-Dynamic Power
- S-MIN: 300
- S-MAX: 300
- Image Size: customize your image size.



4. If you have loaded a design to cut, set parameters as follows:

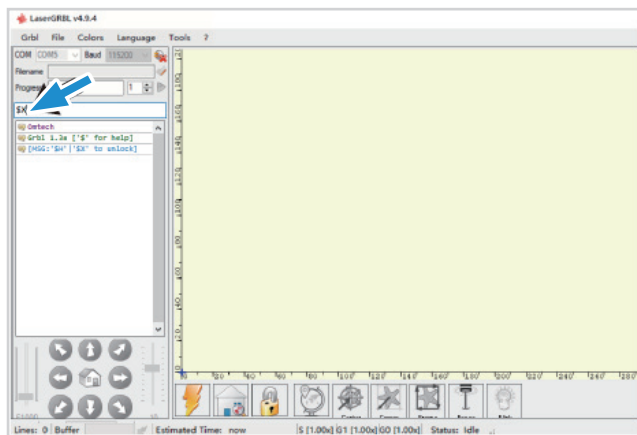
- **Engraving speed:** 600
- **Laser Mode:** M3-Constant Power
- **S-MIN:** 700
- **S-MAX:** 700



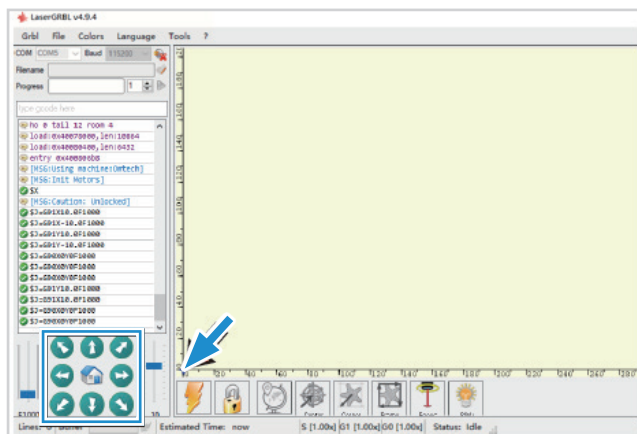
5. Click **Create** to save your change.

6. Prepare your design's location.

- a. Type "\$X" into the GCode field.
- b. Press **Enter** to enable repositioning.



The origin is shown as the center of the cross formed by the X and Y axes.



7. Use the arrows to adjust the placement of your design to match your material's location.

6 Operation

6.2.5 Adjusting the Software's Parameters

Customize your design's contrast and engraving depth by adjusting the speed, power, and other parameters in your engraving software.

If you see the power setting in milliamperes on the ammeter, use the following conversion chart to find the appropriate power setting:

Power	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	80%+
Current	7 mA	8 mA	9 mA	10 mA	12 mA	13 mA	15 mA	17 mA	18 mA	20 mA	21 mA	22 mA	23 mA	24 mA

It is **NOT** recommended to use the laser at full power. The recommended maximum power setting is 70%, as prolonged use above that amount will shorten your laser's service life. The threshold for the lowest setting is around 10% and the laser may not fire at all when set lower than this.

To improve the laser's engraving or cutting effect, increase the amount of energy per unit area by increasing laser power, decreasing the speed parameter or increasing the number of loops. Working too intensely, however, increases the risk of fire and reduces image quality, especially with coated materials.

When working with new materials, remember that you should always start on the low end of likely settings. If the effect is not yet strong enough, you can always rerun the design loop several times or rerun it with more powerful settings until you create the effect that you want. Avoid using high power settings at very low speeds when engraving highly flammable materials.

Resolution should usually be set to 500 dots per inch. Lowering your image resolution can be helpful in some cases, reducing flaming and increasing the energy of the pulse in a way that improves the quality of the resultant image in some materials such as some plastics.

6.2.6 Engraving



- If there is ever an emergency, hit the **Emergency Stop** button **IMMEDIATELY**.
- **DO NOT** stare continuously at the active laser even while wearing laser glasses but watch during use for possible issues like sparks and be prepared to quickly extinguish a fire if necessary.


1. Click  to outline the projected area for engraving or cutting on your material.



The laser traces the boundary, allowing you to ascertain that the laser path is properly aligned with your material setup.

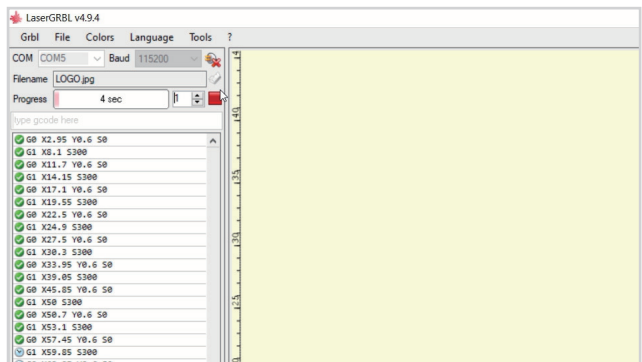
2. Click  to start engraving.



3. Watch for possible issues through the view window.

If any dust or fumes begin to build up within the main bay, pause work periodically by pressing  to allow it to clear the air.

You can pause and resume work by pressing the **Start/Pause** button  or  on the software.



4. Once the laser has stopped, examine the quality of your first run and adjust the parameters in your software as necessary to create the desired effect.
5. Begin your real work in a different location or on a different piece of material.

During repetitive engraving and cutting,

- Periodically check your temperature gauge to maintain a water temperature below 100°F (38°C). If this temperature is reached, stop working and allow your device to cool before further use.
- Periodically check that the tank is at least 2 gallons (7.5 L) of water. Fill the tank with deionized or distilled water or a custom-purpose laser-safe antifreeze as needed.
- Monitor the temperature and humidity of the environment. Ensure that the temperature of the cooling water does not fall below the dew point of the surrounding air to prevent condensation. For tips to prevent condensation, see [§7.3 Water Cooling System](#) on Page 73.

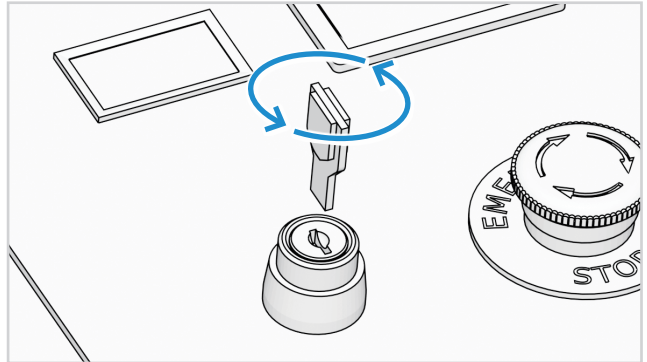


Condensation can lead to water droplets forming on the machine or the floor, which could damage the electronic components of the engraving machine or create a slip hazard over time.

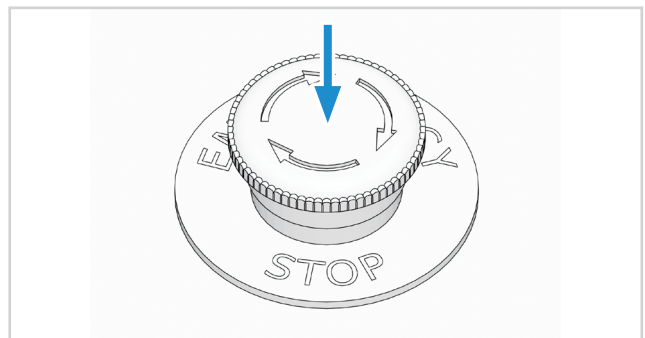
6 Operation

6.2.7 Shutdown

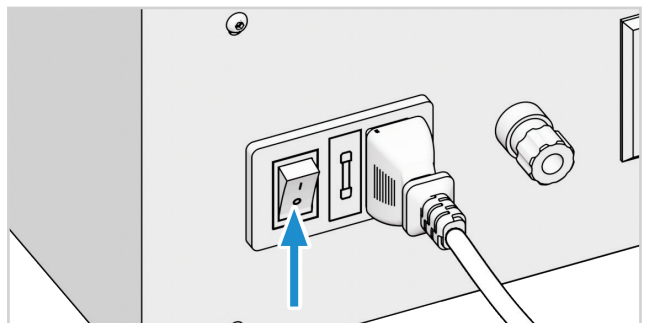
1. When you have finished your project, close your engraving software.
2. Allow the cooling and ventilation systems to continue to run until the air in the main bay is clear and the tube has safely cooled.
3. Turn off the engraver.
 - a. Turn the laser key counterclockwise.



- b. Press the **Emergency Stop** button.



- c. Press the power switch to **0**.



- d. Power off the water cooling system and any ventilation device.

For best results, fully unplug your engraver or turn off its intermediary surge protector.

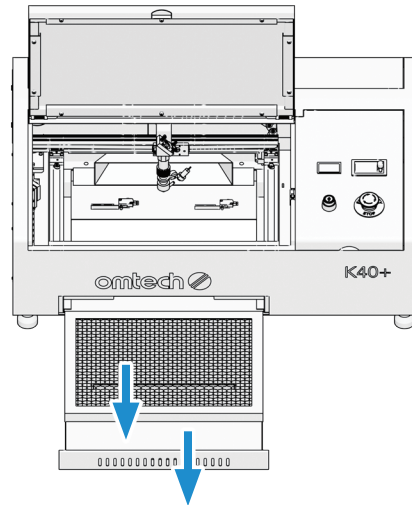
4. Open the cover and remove any dust or debris buildup from the workbed and the various surfaces within the bay.

If the buildup is firm, use a partially damp cloth or similar tools that won't create scratches to remove it. **NEVER** use abrasive papers or steel wools.

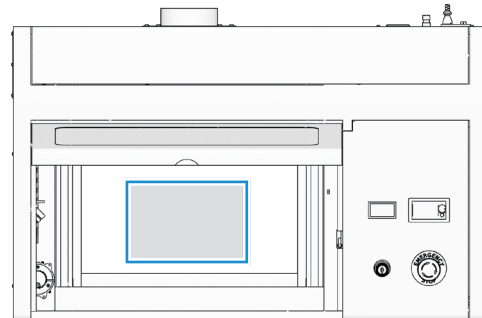
6.3 Instructions for Rotary Operation

6.3.1 Installing Your Rotary Axis

1. Remove the debris tray and the honeycomb workbed. Set them aside where they will not be damaged or fall over.

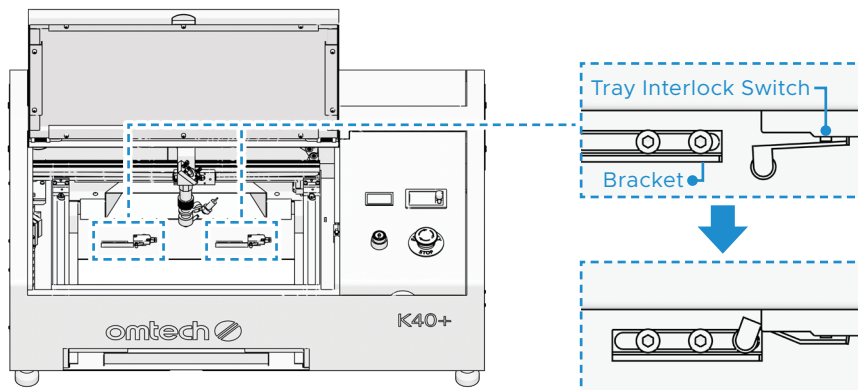


2. Gently slide the X-axis rail along the Y axis to the back of the workbed.
3. Cover the exposed area of your table with a non-reflective plank, preferably an MDF that fits the space.



Warning! Failure to place the panel in a position that totally covers your table may cause a fire hazard.

4. Move the tray interlock switch into a closed position and hold it there by sliding the nearby metal bracket to the right.



Never leave the switch in this position after completing your work. Reenable the switch before leaving the work area.

6 Operation

5. Place your rotary axis on the non-reflective plank.
6. Open the cover of the control panel.
7. Pull off the Y-axis cable from the board and insert the plug of your rotary axis.

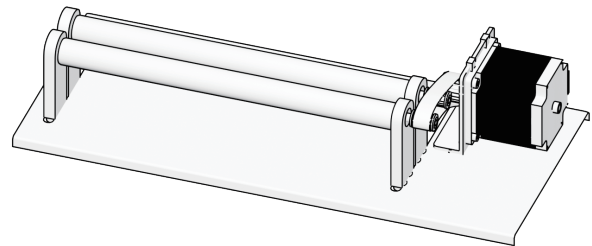


8. If you use LightBurn, enable the rotary axis function in the software following the instructions provided in its separate manual.

For LaserGRBL, the rotary axis function is enabled by plugging the rotary axis cable into the Y axis socket.

6.3.2 Preparing Your Material

Place your object carefully onto the rotary axis.



6.3.3 Focusing Your Laser

See §6.2.2 [Focusing Your Laser](#) on Page 50.

6.3.4 Turning On Your Engraver

See §6.2.3 [Turning On Your Engraver](#) on Page 51.

6.3.5 Loading Your Design

See §6.2.4 [Loading Your Design](#) on Page 53.

6.3.6 Adjusting the Software's Parameters

See §6.2.5 [Adjusting the Software's Parameters](#) on Page 55.

6.3.7 Engraving

See §6.2.6 Engraving on Page 55. If you use LightBurn, adjust the pulse count per rotation parameter when the engraving position in the daily engraving results is not correct.

6.3.8 Shutdown

See §6.2.7 Shutdown on Page 57.

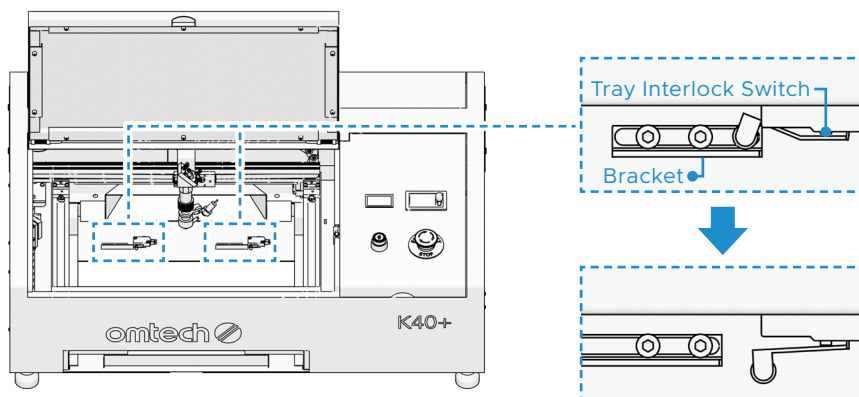
If you use LightBurn, disable the rotary axis function in the software.

6.3.9 Uninstalling Your Rotary Axis

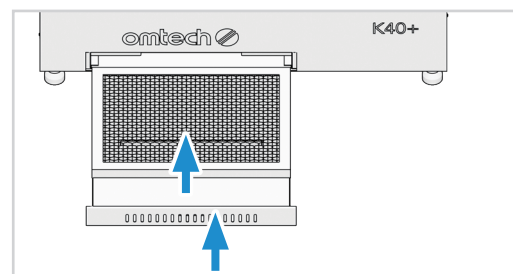
1. Disconnect the plug of your rotary axis from the board and close the cover of the control panel.



2. Remove the rotary axis and the non-reflective plank.
3. Release the tray interlock switch into the open position by sliding the metal bracket to the left.



4. Replace the honeycomb workbed and the debris tray.



5. Close the cover of the engraver.

6 Operation

6.4 Instructions for Specific Materials

The following instructions are suggestions to help speed safe work with a range of materials. The user should research the specific safety and engraving requirements of their specific material to avoid the risk of fire, hazardous dust, corrosive and poisonous fumes, and other potential problems.

Once the product is known to be safe or appropriate protective equipment has been set up, it can be helpful to engrave a test matrix of small boxes produced at various speed and power settings to discover the ideal settings for your design. Alternatively, start with low power and fast speed settings and rerun your design as many times as needed, using progressively greater laser intensity.

6.4.1 Ceramics

When engraving on ceramics, generally use moderate to high power. Using more loops rather than higher power and lower speed can help avoid cracking the material during work. Be mindful of the health risks posed by dust generated from ceramic engraving, especially for repetitive industrial applications. Depending on the material and the amount of work, a fan or even a full ventilation system may be required to address the problem. Similarly, operators and others in the work area may need to use breathing PPE such as masks and respirators.

6.4.2 Glass

When engraving glass, generally use high power and low speed. As with ceramics, it can be helpful to run more loops at lower settings to avoid cracks. Care must be taken when engraving fiberglass and carbon fiber to avoid combinations of settings that produce a laser intensity great enough to damage the structural integrity of its component fibers, producing blurry markings. PPE should be worn to avoid exposure of the eyes, nose, mouth, and skin to the dust produced by working with either material, especially for repetitive industrial applications. Clothing worn while working with fiberglass should be washed separately afterward.

6.4.3 Leather

When engraving leather products, generally use low to moderate power at high speed. Be especially attentive to the possibility of fire, as well as the dust produced in repetitive applications.

6.4.4 Metal

CO₂ laser engravers should not be used for marking, engraving, or cutting metal. They are best suited for working coatings applied to a metal base, and care must be taken not to attempt work on the underlying metal itself. A variety of coatings specialized for CO₂ engraving are available, and the user should follow the instructions provided as the parameters vary from product to product and metal to metal. Generally, work on aluminum coatings should be done more quickly at lower power and work on steel coatings can be done more slowly at higher power.

6.4.5 Paper and Cardboard

When engraving various paper products, generally use low to moderate power and fast speed. Test samples from each batch, as only small parameter differences can separate effects that are too light from those that burn through the substrate. As with leather, be especially attentive to the possibility of fire, as well as the dust produced in repetitive applications.

6.4.6 Plastics

Plastics for engraving are available in many different colors and thicknesses and with many different coatings and surfaces. The majority of available plastics can be well engraved and cut with the laser. Plastics with a microporous surface seem to give the best result because less surface material needs to be removed. When engraving plastics, generally use low-power and high-speed settings. Marking and engraving with too much power or at too low a speed can concentrate too much energy at the point of contact, causing the plastic to melt. Among other problems, this may produce poor engraving quality, noxious fumes, and even fires. High-resolution engraving can cause the same problem, so medium to low-resolution designs should be preferred for most plastics.

6.4.7 Rubber

The various compositions and densities of rubber cause slightly varying engraving depths. Testing various settings on sample pieces of your specific rubber is highly recommended for the best results. When engraving rubber, generally use a consistent high-power setting and create your effects by varying the laser's speed. Microporous rubber materials require a significantly higher speed than standard rubber. Engraving any kind of rubber produces a considerable amount of dust and gas. Depending on the amount of work, breathing PPE and/or a full ventilation system may be required to address the problem.

6 Operation

6.4.8 Stone

When engraving various kinds of stone, generally use moderate power and moderate to fast speed. As with ceramics and glass, be mindful of the dust created (especially for repetitive industrial applications) and take similar measures to ensure the safety of users and others in the work area.

6.4.9 Textiles

When engraving textiles like cloth and fleece, generally use low power and fast speed. As with leather, be especially attentive to the possibility of fire and dust.

6.4.10 Wood

As with rubber, there is a huge variety of woods, and testing your specific material is essential to get the best results. In general, wood with consistent grain and coloring engraves more evenly. Knotted wood produces uneven effects, while resinous wood produces greater edge contrast. Some softwoods like balsa, cork, and pine engrave well (albeit with low contrast) at low or moderate power settings and high speed. Others like fir suffer from uneven fibers that usually produce a poor effect in any setting. Hardwoods like cherry and oak engrave well at high power settings and low speed. Manufactured wood products can vary from brand to brand, mostly based on their glue composition and abundance. MDF works well but creates dark edges when cut.

In addition to the risk of fire with any wood product, extra care must be taken with the fumes from the glue used in plywood and other manufactured woods. Some are too dangerous to work with at all, while others require careful ventilation and the use of breathing PPE for repetitive industrial applications. Wood toxicity should also be examined, as the dust from some natural woods including oleander can also cause nausea and cardiac problems in high enough amounts.

7 Maintenance

7.1 Maintenance Schedule



The use of procedures other than those specified herein may result in hazardous laser radiation exposure.

Before any cleaning or maintenance work, always switch off the engraver and disconnect it from its power supply.

Always keep the system clean, as flammable debris in the working and exhaust areas constitutes a fire hazard.

ONLY allow trained and skilled professionals to modify or disassemble this engraver.

Follow the instructions below when maintaining:

- Clean and cool water or laser-safe coolant must be provided to the system **at all times**.
- Confirm the tank is at least two-thirds full before and **after each use**.
- Replace your water **each week** for the best results.
- The workbed must be cleaned and the waste bin emptied **every day**.
- The mirrors and the focus lens must be checked **every day** and cleaned **if required**.
- The exhaust system must be checked **every week** and cleaned **if required**.
- The beam alignment should be checked **weekly**.
- The wiring should be checked **every week** for loose connections.
- The guide rails should be cleaned and lubricated **at least twice a month**.
- The air assist must be checked every month and cleaned if required.
- All other components of the laser machine should be checked **every month** and cleaned **where required**.

In commercial settings, keep a cleaning and maintenance log in a visible location near the engraver. Have operators date and sign the log as cleaning and maintenance are carried out.

7 Maintenance

7.2 Cleaning



ALWAYS allow any fluid used in any cleaning to dry completely before further use of the engraver.

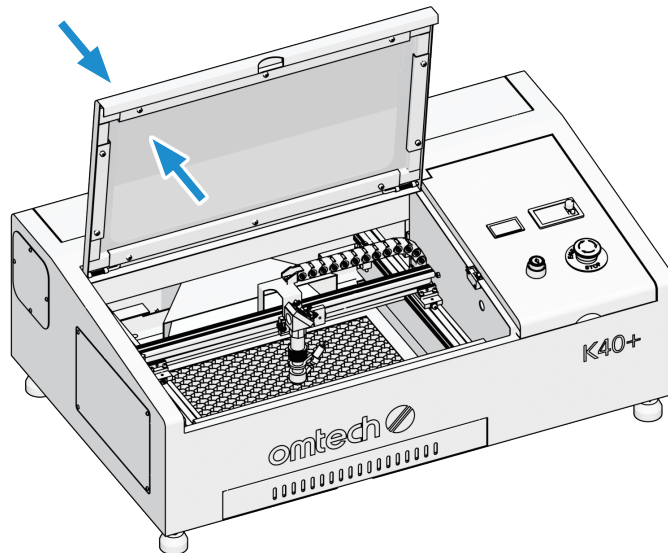
7.2.1 Cleaning the Main Bay and Engraver

Check at least once a day whether dust has accumulated in the main engraving bay. If so, it must be removed. The exact cleaning interval and requirements strongly depend on the material being processed and the operating time of the device. A clean machine guarantees optimal performance and reduces service costs, as well as reducing the risk of fire or injury.

Viewing Window

Clean the viewing window with mild cleansers and a lens cotton cloth.

DO NOT use paper towels as they can scratch the acrylic and reduce the cover's ability to protect you from laser radiation.



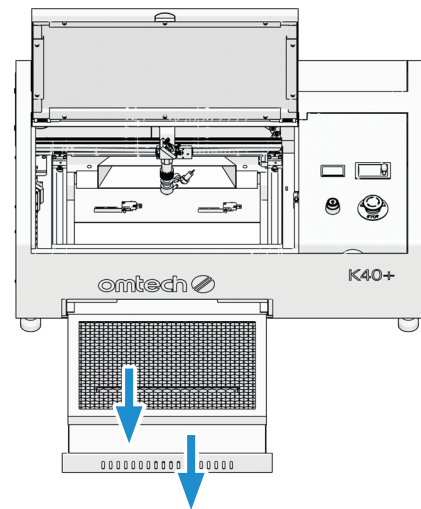
Interior of the Main Bay



Do not use caustic chemicals or harsh abrasives. Be careful not to allow any electronic component to become wet and let all surfaces dry completely before further use.

Do not leave standing water in the tray.

- Clean the interior of the main bay thoroughly, removing any debris particles or deposits. Paper towels and window cleaner are recommended.



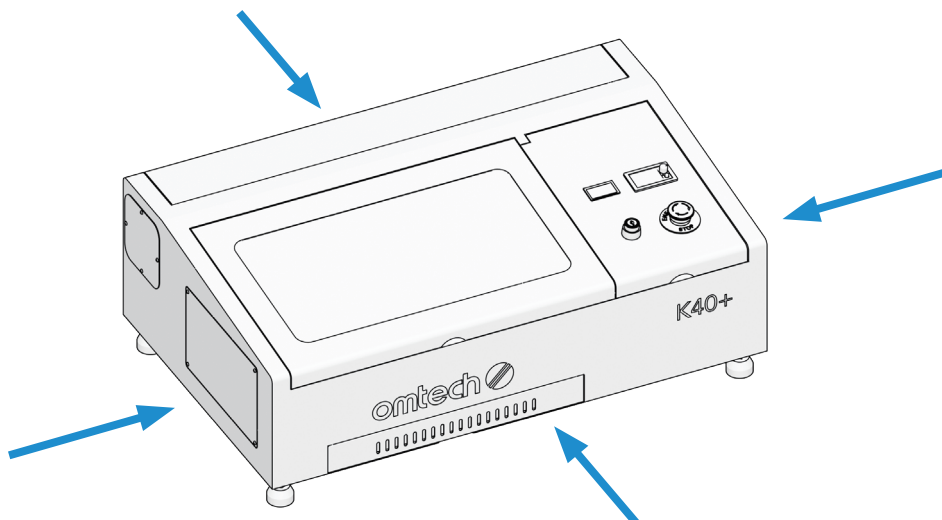
- When necessary, clean the cover of the laser tube after it has been allowed to cool completely. Allow the fluid used in cleaning to dry completely before further use of the engraver.

Exterior



Do not use caustic chemicals or harsh abrasives. Be careful not to allow any electronic component to become wet and let all surfaces dry completely before further use.

When necessary, clean the engraver's other surfaces with a soft cloth or wipe them using a cloth moderately wetted with mild detergent.



7 Maintenance

7.2.2 Cleaning the Focus Lens

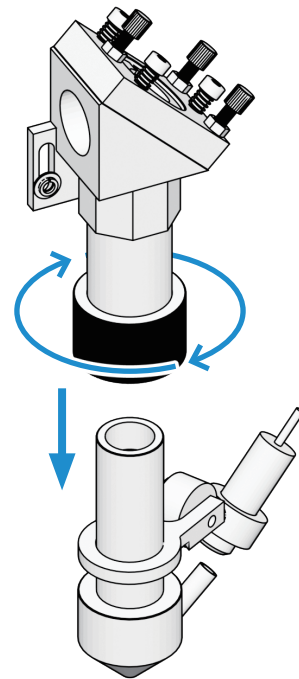
The lens has a durable coating and won't be damaged by correct and careful cleaning. You should check the lens and the third mirror daily and clean them if there is any debris or haze on their surfaces. Your laser will be less efficient and heat buildup on the oil or dust itself can damage them.



Be careful in all of the following steps not to directly touch the lens surface with your hands or any dirty, oily, or abrasive surface. Use lens-safe gloves or cloths only.

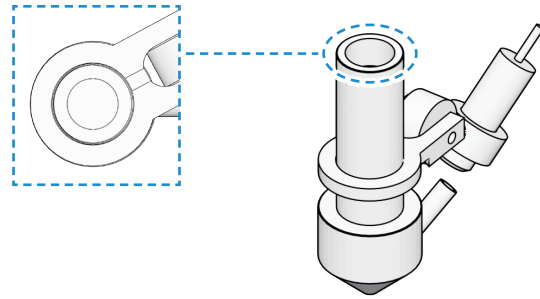
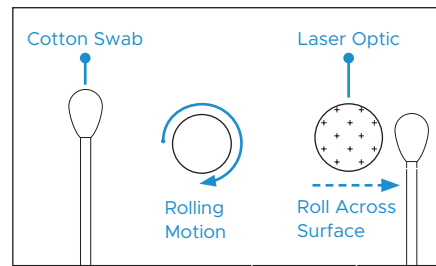
To clean the focus lens:

1. Move the workbed to about 4 inches (10 cm) beneath the bottom of the lens nozzle.
2. Move the laser head to a convenient location and put soft material underneath it so the lens will be protected if it accidentally falls loose during removal or replacement.
3. Loosen the locking screw on the laser head.



4. Carefully slide the focusing unit out.

5. Examine the lens's surface and clean it with a cotton bud and lens-cleaning fluid as needed until no dust or haze is present.



NEVER use the same cleaning tissue twice. Dust accumulated during the first use might scratch the other side of the lens during the second.

6. Carefully reassemble the focusing unit in reverse order.

7 Maintenance

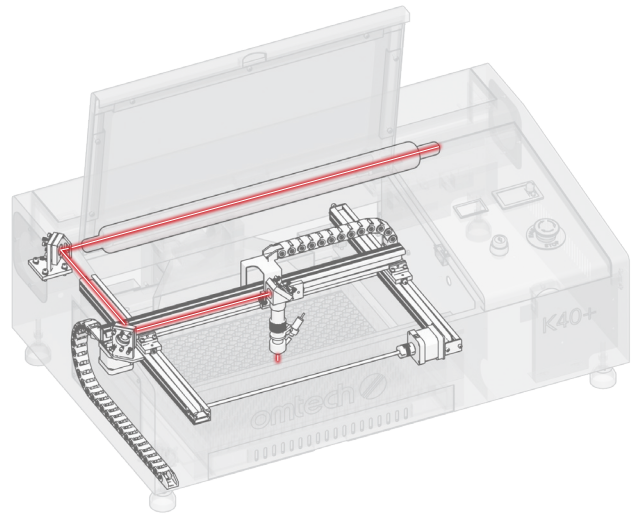
7.2.3 Cleaning the Mirrors

The mirrors should be similarly cleaned if there is any debris or haze on their surfaces to improve performance and avoid permanent damage.

The 1st mirror is located at the back left of the machine beyond the far end of the left Y axis. It is more easily reached from the laser bay behind the top rear access door.

The 2nd mirror is located on the left Y axis beside its connection to the X-axis rail. It may be easier to reach from the top left access door.

The 3rd mirror is located on top of the laser head on the X-axis rail.



The 1st and 2nd mirrors should be checked daily if needed but are usually fine if they are only checked once a week. The most detritus accumulates on the 3rd mirror and it should be checked daily along with the focus lens.

The mirrors can be cleaned in place using a lens-cleaning tissue or lens-safe cloth.



Be careful not to touch the mirrors' surfaces directly. Avoid pressing hard enough to grind in any debris and risk scratching.

While cleaning optics, make sure to protect the pulley belts from all cleaning fluids. Belts will deteriorate from contact with chemicals and oils.

To clean the installed mirrors:

1. **DISCONNECT MACHINE FROM POWER.**
2. Thoroughly wash and dry your hands.

In the event you have to handle lenses or mirrors, always wear sterile, disposable gloves.

3. Use small bellows to blow any particulates off mirror surface.

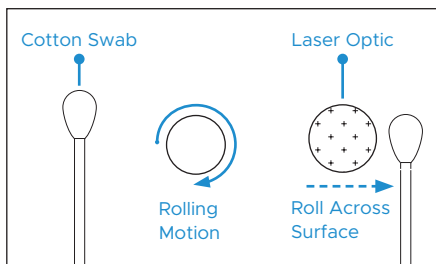


DO NOT physically wipe mirrors.

4. Soak ends of several cotton swabs in denatured or isopropyl alcohol. Saturate swabs with enough solution to be moist, but when pressed against a surface, solution does not squeeze out and drip.
5. With gentle rolling motion, roll swab across surface of lens/mirror to absorb any particulates stuck to surface.



Dislodge and lift particulates off of surface by rolling cotton swab, which exposes clean cotton as you progress. Rubbing or dragging swab across surface without rolling it can create scratches and damage mirrors.



6. Moisten dry swab with 1–3 drops of same solution, roll swab across surface of mirror, and allow surface to air dry.
7. Inspect mirror surface:

If any particulates or surface stains remain, repeat steps 3–6.

If any particulates or surface stains are still present after second cleaning, they are most likely permanently burned into surface. Replace the mirrors.

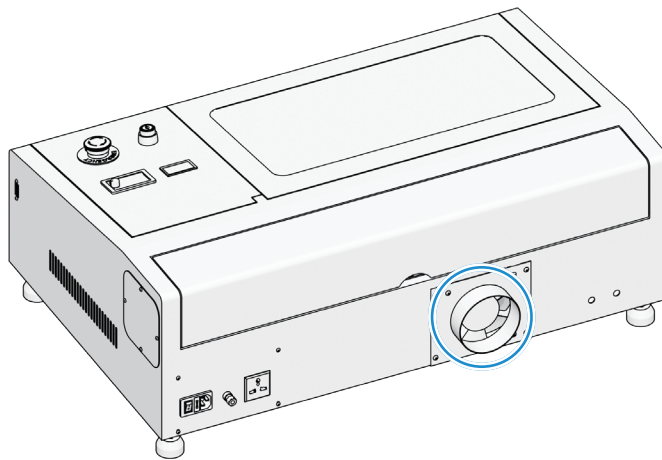
7 Maintenance

7.2.4 Cleaning the Exhaust System

Check and clean the exhaust system at least once a week. Always cease work and clean your exhaust system if you ever notice the fan making more noise than usual.

- Check the internal fan and surrounding ducts for excessive accumulation of dust and debris.

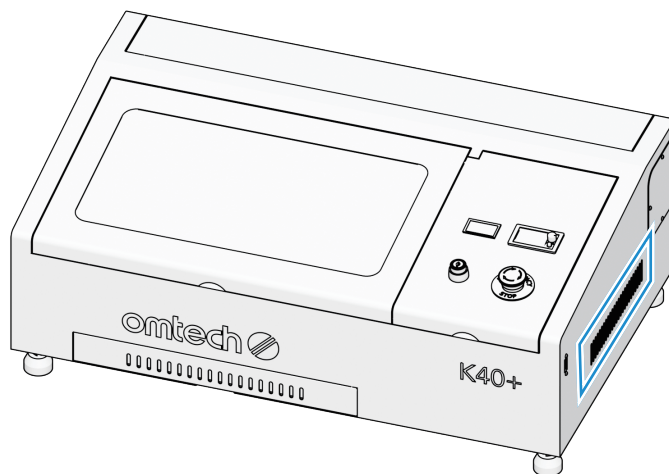
For best results, remove the exhaust hose, use a brush, vacuum, or compressed air to remove large accumulations of dust and debris, and use mild cleansers and soft rags or paper towels to fully clean the fan and its blades at least once a month. Clean the exhaust hose itself before reconnecting it to the fan.



- While you are doing the weekly inspection, check the seams and joints of the ducts for any damage or leaks.

If any are found, immediately repair them. Caulk or special-purpose aluminum foil tape generally works best if available; standard duct tape can deteriorate over time, especially near heated components.

- Additionally, clean any dust or debris from the engraver's side vents as needed.



7.2.5 Cleaning the Water Cooling System



NEVER touch or adjust your engraver's water supply while your engraver is still connected to power.

Because distilled water can leach chemicals from your tank and/or hoses and spread these possibly corrosive particles to the laser tube, change your water each week regardless of its level or clarity to maximize your laser's service life.

While changing the water, clean the tank and pump completely to minimize any buildup of residue or chemicals.

1. Turn off the laser engraver and unplug the pump.
2. Open the water tank, remove the pump, and clean both.
3. Disconnect the pump's blue hose, allowing it to drain, and clean it if needed.
4. Reconnect the hose and replace the pump inside the tank.
5. Add your new water to the tank.
6. Plug the pump in again and allow it to run for 2–3 minutes to restore the water throughout the engraver's cooling system.
7. Before starting the laser, visually confirm water is running through the laser tube without bubbles and check the water temperature.

7 Maintenance

7.3 Water Cooling System



NEVER touch or adjust your engraver's water supply while your engraver is still connected to power.



Always fill the water tank with deionized or distilled water or a custom-purpose laser-safe antifreeze. Using tap water for any purpose but rinsing out cleansers (see §7.2.5 [Cleaning the Cooling System](#) above) will gradually degrade the quality of your engraver and may even cause dangerous mineral buildup within the cooling system. Never use generic antifreeze for the same reason.

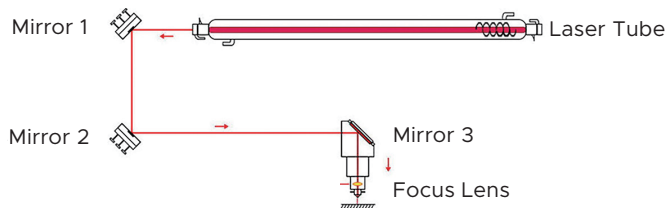
Always make sure the water cooling system is in good conditions by doing the following checks:

- The laser tube requires cool and clean distilled water to avoid overheating. Tepid water at room temperature or a little below is ideal.
- The laser tube requires at least 2 gallons (7.5 L) of cool and clean distilled water or other lasersafe coolant to avoid overheating. Check that the tank is at least 2 gallons (7.5 L) of water before and after each use.
- If the temperature of the water ever approaches 100°F (38 ° C), discontinue work until it has cooled or find a way to reduce its temperature without interrupting the supply of water to the laser tube. The water should never be allowed to become too cold either, which could also cause the glass laser tube to shatter during use. During winter or if ice is used to cool hot water, ensure the temperature never falls below 50°F (10° C).
- More water should be added every few days to ensure evaporation does not cause the pump to become exposed during use
- Ensure that the temperature of the cooling water does not fall below the dew point of the surrounding air to prevent condensation. Here are some tips to prevent condensation:
 - ✧ Use a hygrometer to monitor the temperature and humidity levels in the environment.
 - ✧ If possible, increase the ambient temperature to be at least above the temperature of the cooling water.
 - ✧ Lower the relative humidity of the room, for instance, by using a dehumidifier.
 - ✧ Insulate the cooling water pipes to reduce the likelihood of their surfaces falling below the dew point.
 - ✧ Regularly check the cooling system to ensure it is operating at optimal conditions.

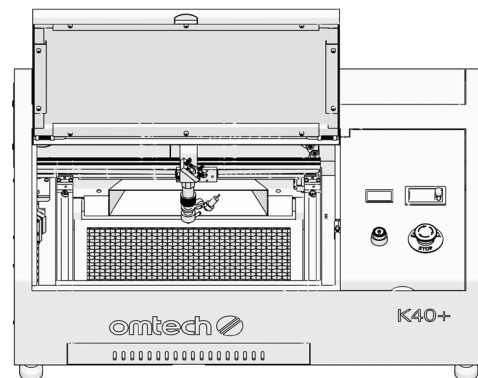
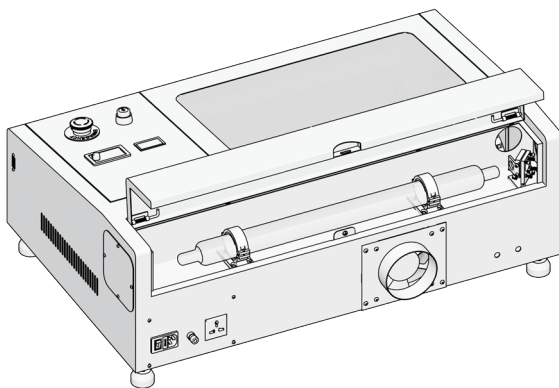
Adjust the above measures appropriately according to your specific environment and equipment requirements.

7.4 Laser Path Alignment

Having a proper beam alignment is important for the overall efficiency of the engraver and the quality of its work. This engraver went through a complete beam alignment before shipping. When the engraver first arrives and about once a week during normal operation, however, it is recommended to confirm that alignment is still at acceptable levels and that the mirrors and focus lens have not shifted due to the movement of the machine.



You will need to place a piece of tape at each stage of the laser path, marking it to confirm that the stage remains correctly aligned. When it is not, you will use the laser tube's brackets or the screws on the back of the misaligned mirror to correct the problem. Once the provided tape runs out, we recommend masking tape as it is easy to manage and use.



Performing a beam alignment can expose the operator to small amounts of radiation if performed carelessly.

Follow these procedures correctly and always take caution when performing a beam alignment.



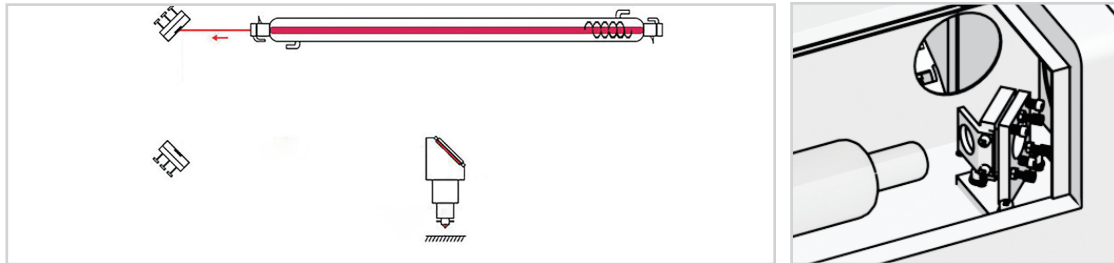
To safely perform a beam alignment, it is recommended to use low power levels. 8 mA or 11 % should be sufficient to leave a clear mark without igniting the testing tape. However, if the laser tube is not emitting a beam, the power can be gradually increased until a laser is emitted. Any higher percentage will cause the laser to ignite the testing tape instead of marking it.

7 Maintenance

7.4.1 Laser Tube Alignment

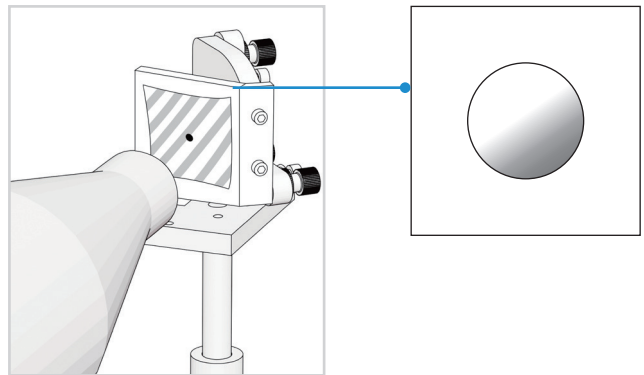
Make sure the laser is well aligned between the laser tube and 1st mirror.

Laser Path



To test the alignment of the laser tube with the 1st mirror:

1. Cut out a piece of tape and place it on the 1st mirror's frame.



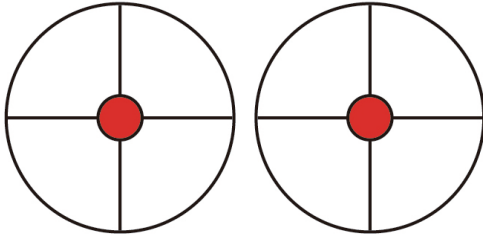
2. Turn on the engraver and set the power level to 11% or lower.
3. Manually fire the laser.

You should be able to see a small mark on the tape. If it is not noticeable, fire the laser again.

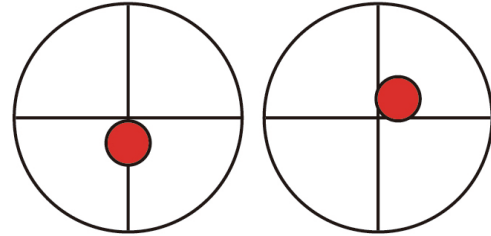


Always make sure the path is clear between the laser and its target. Never allow foreign objects between the laser and its target. Always close the cover before firing the laser. Do not look directly at the active laser through the cover during this procedure.

4. Check the marks on the tap.



These marks are OK.



These marks require adjustment.

The laser mark should be near the center of the hole. If the laser is not centered on the 1st mirror, cut the power to your laser and carefully adjust the laser tube in its brackets. This may require loosening the bolts on its stand.

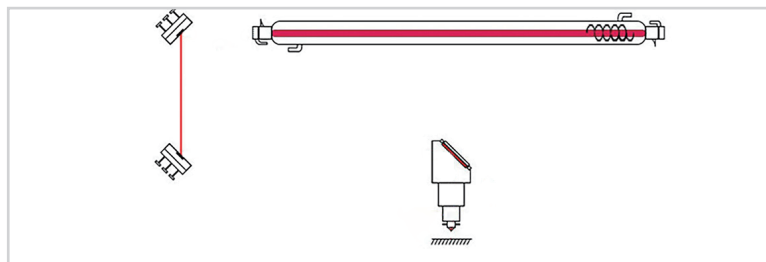


Be careful not to overloosen the bolts and not to overtighten them.
Only adjust one stand at a time.

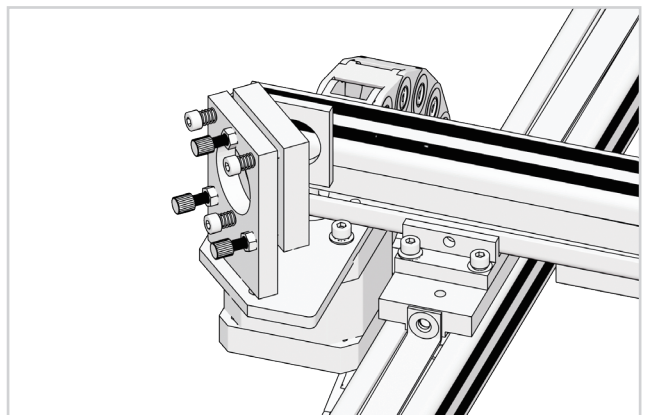
7.4.2 1st Mirror Alignment

After ensuring the laser is well aligned between the laser tube and 1st mirror, check the alignment between the 1st and 2nd mirrors.

Laser Path



1. Gently move the X axis rail along the Y axis to send the 2nd mirror to the back of the bed.



7 Maintenance

2. Once set, place a piece of tape on the 2nd mirror's frame.



DO NOT place the tape directly onto the mirror.

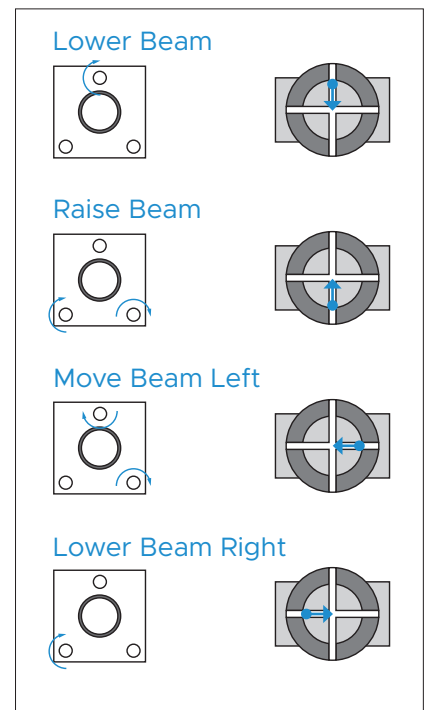
3. Repeat the steps 2–4 from §7.3.1 [Laser Tube Alignment](#) above.
4. If the laser is not centered on the 2nd mirror, you will need to adjust the 1st mirror's set screws accordingly.

To adjust the mirror:

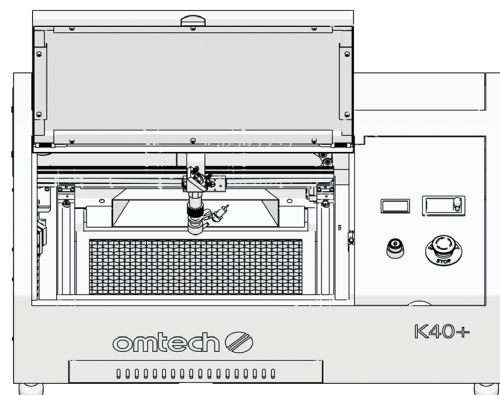
- a. Loosen the nut on the screw.
- b. Slightly turn the screw either clockwise or counterclockwise.

Each screw adjusts a different position or angle. Keep track of which screw you are adjusting and the direction of adjustment. Do not turn the screw more than $\frac{1}{4}$ turn at a time, especially at first.

- c. Test the position of the laser after each adjustment so that you learn the effect of each change.
- d. Test until the beam is well aligned.
- e. Retighten the nuts on the screws once all adjustments are completed.



5. Gently move the X axis rail along the Y axis to send the 2nd mirror to the front of the bed along the Y axis.



- Once set, place another piece of tape on the 2nd mirror's frame.



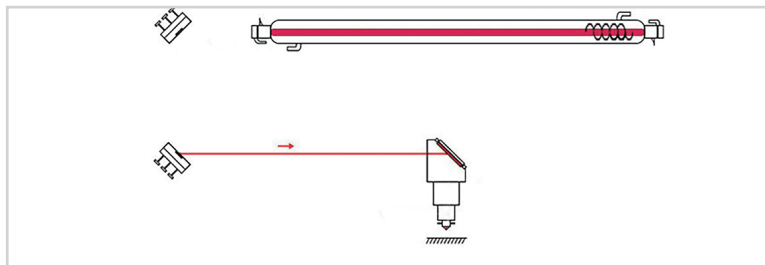
DO NOT place the tape directly onto the mirror.

- Repeat the steps 2–4 from §7.3.1 Laser Tube Alignment above.
- If necessary, adjust the set screws on the 1st mirror. Test again until the beam is well aligned and retighten the nuts on the set screws.

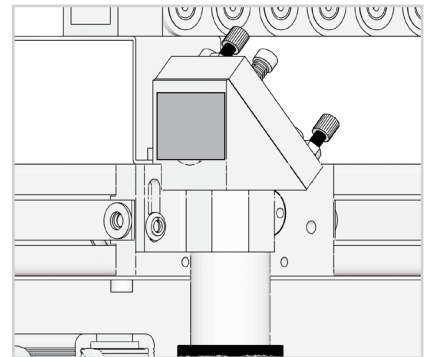
7.4.3 2nd Mirror Alignment

After ensuring the laser is well aligned between the 1st and 2nd mirrors, check the alignment between the 2nd and 3rd mirrors.

Laser Path



- Gently move the X axis rail along the Y axis to send the 2nd mirror to the back of the bed. Gently move the laser head along the X axis to the far left.



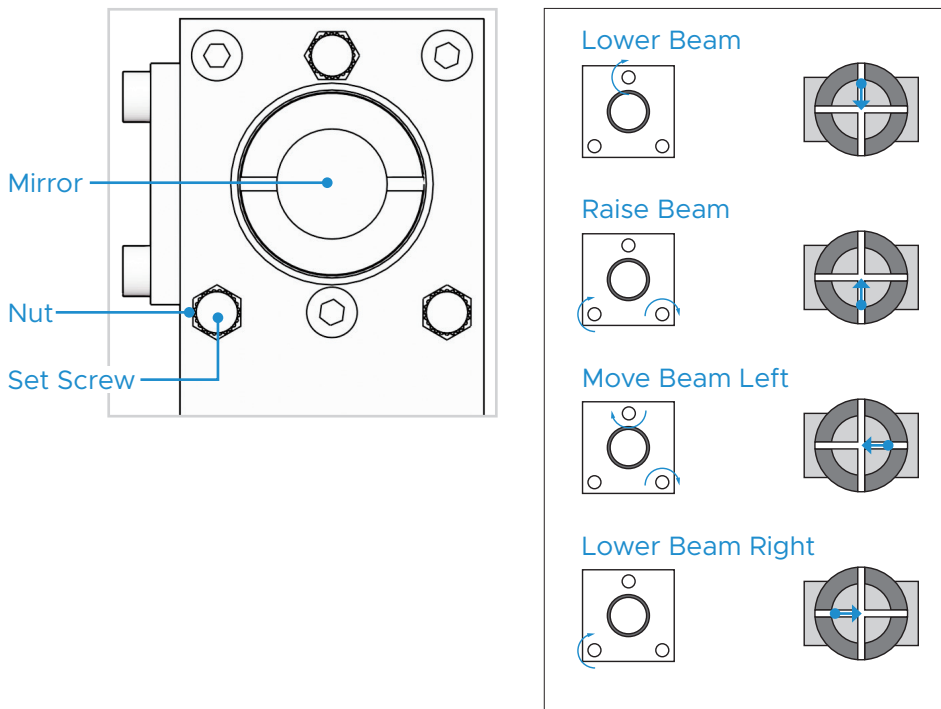
7 Maintenance

2. Once set, place a piece of tape on the 3rd mirror's frame.



DO NOT place the tape directly onto the mirror.

3. Repeat the steps and adjustments from §7.4.2 1st Mirror Alignment above.
4. If necessary, adjust the set screws on the 2nd mirror. Test again until the beam is well aligned and retighten the nuts on the set screws.



5. Once set, place a piece of tape on the 3rd mirror's frame.



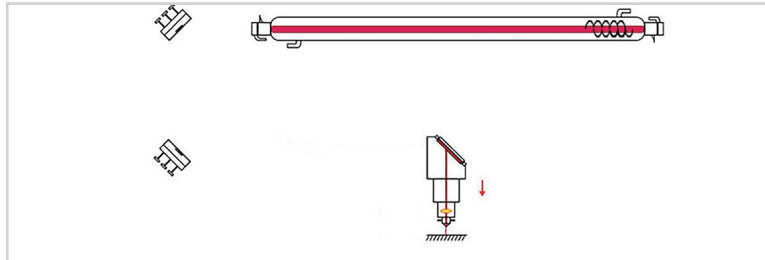
DO NOT place the tape directly onto the mirror.

6. If necessary, adjust the set screws on the 2nd mirror. Test again until the beam is well aligned and retighten the nuts on the set screws.

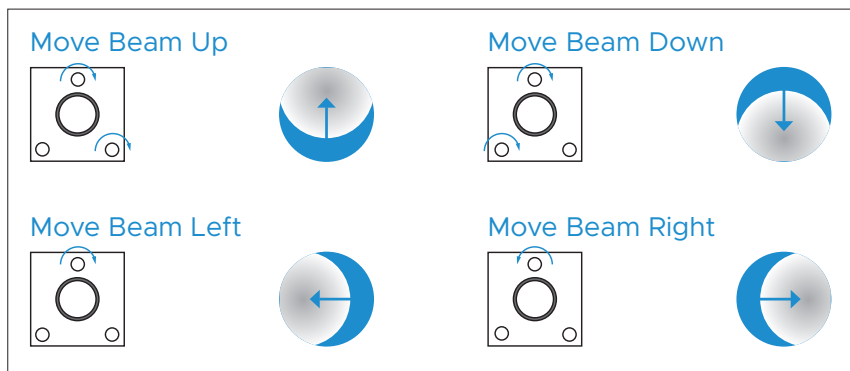
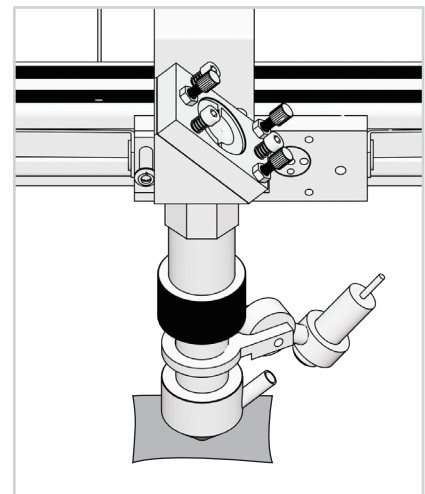
7.4.4 3rd Mirror Alignment

After ensuring the laser is well aligned between the 2nd and 3rd mirrors, check the alignment between the 3rd mirror and the workbed.

Laser Path



1. Unplug the air assist hose from the laser head.
2. Place a piece of tape across the bottom of the laser head and press it onto the nozzle with some force.
This will leave a ring mark that can help you check the accuracy.
3. Repeat the steps from [§7.4.1 Laser Tube Alignment](#) (Page 75).
4. If the laser is not centered through the laser head, adjust the 3rd mirror's set screws accordingly as in [§7.4.2 1st Mirror Alignment](#) (Page 76). Test again until the beam is well aligned and retighten the nuts on the set screws.



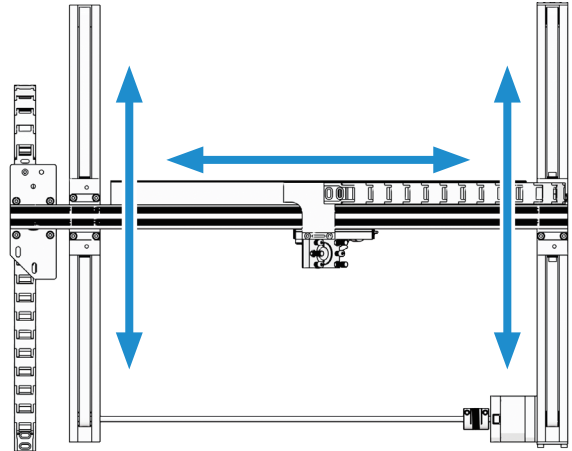
When the laser is well centered along the entire path from the tube to the workbed, your laser mirrors are all correctly calibrated and (assuming they are clean) performing at optimum efficiency.

7 Maintenance

7.5 Rail Lubrication

For best results, clean and lubricate the engraver's guide rails every two weeks.

1. Turn off the laser engraver.
2. Gently move the laser head out of the way.
3. Wipe away all dust and debris along the X and Y axis rails with a dry cotton cloth until they are shiny and clean.



4. Lubricate both the rails and screws with white lithium grease.
5. Gently move the laser head and X axis to distribute the lubricant evenly along both rails.

7.6 Parts Replacement



ALWAYS completely disconnect the engraver from its power supply before replacing any parts.

This engraver should not be modified or disassembled by anyone except trained and skilled professionals, but some consumable parts may require replacement after prolonged use. Be sure only to use identical or compatible replacement parts with this engraver. Contact your vendor or our technicians if you have any questions about fitment. Using incompatible components is highly dangerous and waives all the manufacturer's liability for any damage or injury caused.

8 Troubleshooting



8.1 Connection

The Engraver Can't Find Device via USB

Issue	
After powering the device on and connecting it to the computer with a USB cable, the machine's name can't be found in the device list.	
Solution	
Check the USB Cable Connection	<ol style="list-style-type: none">1. Check and make sure the connection is secure.2. Replug the USB cable at both ends if necessary.
Malfunctioning USB Cable or Computer USB Port	<ol style="list-style-type: none">1. Replace the USB cable, the USB port, and the computer port.2. Turn on the engraver and open the software.3. Check if the driver application of the engraver exists in the following ways. For Windows: Right-click the start button on your computer. Click Device Manager. Click Network adapters and check if the USB Ethernet/RNDIS Gadget exists. For Mac: <ol style="list-style-type: none">1. Click System Information.2. Go to Hardware and click USB.3. Check if the RNDIS/Ethernet Gadget exists.
Check VPN	Exit the VPN software and try again.
Check Ping	The firewall may disable ping. <ol style="list-style-type: none">1. Click the right button to run the software in Administrator Mode.2. Allow the permission "Default Allow Specific Outbound ICMP" in the firewall software.
Check SIP	If the MAC system is under SIP protection, the device may be blocked and can't be connected. Disable SIP according to the MAC manual.
Check the Compatibility of the Cable	The engraver does not support a double-end USB-C cable. Connect the engraver using the original USB-A cable or a USB-C to the USB-A docking station instead.

8.2 Hardware

8.2.1 Laser Tube Won't Light Up

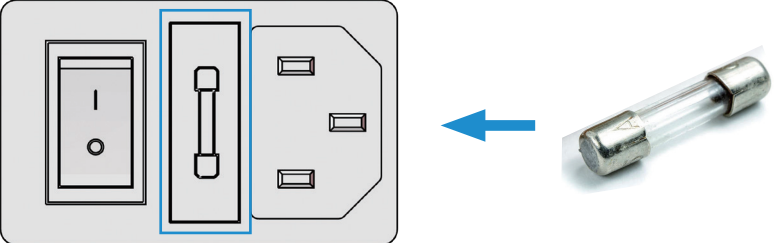
Issue	
<p>The laser tube won't light up when trying to process after turning on the engraver.</p> <div style="border: 1px solid blue; border-radius: 15px; padding: 10px; margin: 10px 0;">  <p>Do not touch the laser tube when it is illuminating.</p> </div>	
Solution	
Adjust the Laser Power Setting	<p>As the laser tube ages, more power will be needed for the same level of laser activation as before.</p> <p>Try to process by increasing the power to 80%, and observe if the laser tube will light up.</p>
Check for Cracks in the Tube	<ol style="list-style-type: none"> 1. Disconnect the power supply of the machine and remove the rear upper cover. 2. Inspect the laser tube for any cracks, both inside and outside. If any cracks have been found, replace the tube.
Check the Cable and Connection	<ol style="list-style-type: none"> 1. Disconnect the power supply of the machine and remove the cover of the control panel. 2. Inspect the cable as shown in the picture below for any signs of breakage or detachment. 3. Check if there is any looseness in the cable connection at both ends as shown. 4. Fix it or replug the cable to ensure a proper connection. 
Check the Power Supply of the Laser Tube	<p>Have a technician check the power supply of the laser tube or contact our customer service support team for further analysis.</p>
Replace the Laser Tube	<p>If none of the above works, the laser tube may be faulty. Please take a video of the problem, film the troubleshooting steps you have taken, and contact our service team for further assistance.</p>

8 Troubleshooting

8.2.2 Engraver Won't Fire Laser

Issue	
The laser tube lights up as usual, but there is no laser coming out from the laser module.	
Solution	
Check the Installation	Have a technician check all the mirrors for any missing, misaligned, or incorrect installation or contact our customer service support team for instructions.
Adjust the Laser Power Setting	<p>The laser requires a certain amount of power to activate—This is called the minimum activation power. As the laser tube ages, however, more power will be needed for the same level of laser activation as before.</p> <p>You can either increase the processing power directly or adjust the device settings to raise the lowest output power so it can reach the minimum power for laser activation.</p> <p>If the processing power is lower than the lowest output power, the latter will be used as the processing power.</p>
Check the Focal Lens	<p>Check if the focal lens is missing and reinstall it.</p> <p>See §7.2.2 Cleaning the Focus Lens (Page 67).</p>
Clean the Mirrors and Focal Lens	Check for any residue or stains on the surface of the mirrors and focal lens. For instructions on cleaning, see §7.2.2 Cleaning the Focus Lens (Page 67) and §7.2.3 Cleaning the Mirrors (Page 69).
Recalibrate the Laser Path	Contact our service to detect if there is any deviation in the optical laser path and calibrate if it is severely deviated.

8.2.3 Engraver Gets Non-Responsive after Power-on

Issue	
After the engraver is powered on by the rear switch and Emergency Stop button, it doesn't give any response. The ammeter display screen, light panel, water pump, motor, etc. won't work at all.	
Solution	
Check the Power Cable	Check if the power cable is properly plugged in on both ends.
Replace the Fuse	<ol style="list-style-type: none">1. Unplug the power cable.2. Take off the fuse box next to the switch.3. Check the fuse. Replace the fuse if it's blown. 

8.3 Processing

8.3.1 Poor Smoke Evacuation during Processing

Issue

When using the engraver for processing, the smoke generated may fail to disperse properly, resulting in significant accumulation inside the machine or leakage from the machine's seams.

Before troubleshooting

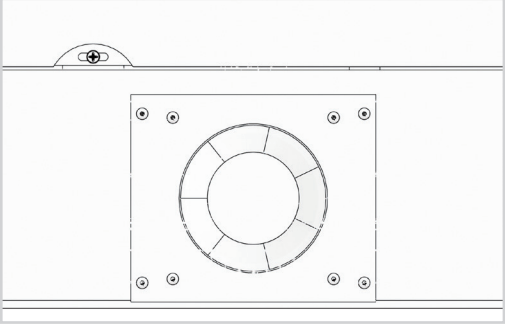
Firstly, remove all accessory devices from the engraver (e.g., smoke purifier, extended exhaust pipe, extended exhaust fan, etc.), retaining only the exhaust pipe provided with the machine. Process the material again and evaluate smoke evacuation effectiveness.

- Scenario 1: If smoke evacuation remains poor
- Scenario 2: If smoke evacuation improves

8 Troubleshooting

Scenario 1: If smoke evacuation remains poor

If the smoke evacuation is still poor after removing the accessory devices, the issue may be related to the installation of the smoke exhaust fan.

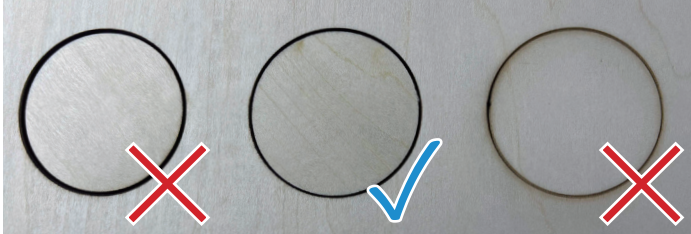
Check the smoke exhaust pipe	Ensure that the smoke exhaust pipe is not pressed or bent, hindering proper smoke evacuation.
Check the installation of the fan	<p>Remove the smoke exhaust pipe at the rear plate to observe if the fan is installed correctly.</p> <ul style="list-style-type: none">• The correct installation displays the fan blades inward.• If not, remove the fan cover and reinstall the fan. 

Scenario 2: If smoke evacuation improves

If the smoke evacuation improves after removing the accessory devices, the issue is related to the used devices.

Check the airflow	For better smoke evacuation, make sure that your extended smoke exhaust fan or purifier has an airflow greater than 200 cfm.
Check the filters	Remove all the filters from the purifier used for the engraver and test the smoke evacuation. If it improves without filters, consider replacements.
Check the extended exhaust pipe	Confirm the smoke exhaust pipe isn't pressed, bent, or excessively lengthy for efficient smoke evacuation.

8.3.2 Not Cutting Through the Material

Issue	
<p>The engraver won't fully and effectively cut through the material as expected.</p> 	
Solution	
Check the Processing Parameters	<p>For the materials suggested in this manual, you can choose the recommended parameter values for cutting.</p> <p>For those not suggested, you can get the ideal parameter values after several tests.</p>
Check the Material Distance/Thickness Value	<p>Check if the material thickness/distance is out of the standard range of the engraver.</p>
Check the Mirrors and the Focal Lens for Stains	<p>See §7.2.2 Cleaning the Focus Lens (Page 67) and §7.2.3 Cleaning the Mirrors (Page 69).</p>
Check the Power of the Laser Tube	<p>It is common that the power of the CO₂ laser tube degrades over time.</p> <p>You can try the following methods to improve the performance of the cutting process: increase the power, lower the speed, and increase the processing pass.</p> <p>If the power drops drastically, have a technician replace the laser tube.</p>
Increase the airflow rate	<p>Adjust the airflow of the your external fan.</p>
Check the Focal Lens Installation	<p>When the focal lens is not installed properly, the laser spot will become larger, decreasing cutting performance.</p> <p>Remove the focal lens and install it again. See §7.2.2 Cleaning the Focus Lens (Page 67) .</p>
Use Compatible Material	<p>Some materials are not cuttable with the engraver. For recommended materials, see §1.6 Material Safety Instructions (Page 6) and §6.4 Instructions for Specific Materials (Page 61).</p>
Calibrate the Laser Path	<p>When the laser path is misaligned, the laser performance may vary significantly in different processing areas.</p> <p>Contact our service to guide you on calibrating the laser path if the solutions above don't work.</p>

8 Troubleshooting

8.3.3 Poor Engraving Results

Issue

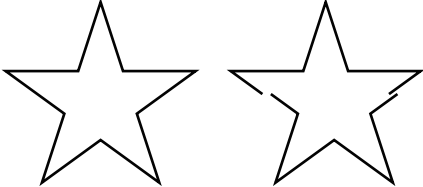
When this issue occurs, you may find the engraving performance is not as expected: the pattern appears blurry, and the engraving outcome is excessively darkening or too shallow to be identified.

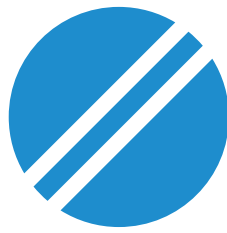


Solution

Check the Processing Parameters	<p>For materials suggested in this manual, you can choose the recommended parameter values for cutting.</p> <p>For those not suggested, you can get the ideal parameter values after several tests.</p>
Check the Material Distance/Thickness Value	Check if the material thickness/distance is out of the standard range of the engraver.
Set a lower airflow rate	Slow the airflow of the your external fan.
Check the Focal Lens	<p>When the focal lens is not installed properly, the laser spot will become larger, decreasing engraving performance.</p> <p>See §7.2.2 Cleaning the Focus Lens (Page 67).</p>
Check the Material	<p>Some materials can be harder to engrave by laser. To get better results, set a higher processing power or use less dense materials.</p> <p>For recommended settings on materials, see §6.4 Instructions for Specific Materials (Page 61).</p>
Calibrate the Laser Path	<p>When the laser path is misaligned, the laser performance may vary significantly in different processing areas.</p> <p>Contact our service to guide you on calibrating the laser path if the solutions above don't work.</p>

8.3.4 Engraving Image Shifts during Processing

Issue	
<p>The engraved image is deviated or won't close up because of the losing steps in processing.</p> <div style="text-align: center;">  </div>	
Solution	
Lower the Speed of the Engraving Process	<p>If the processing speed is too fast, it may cause step loss.</p> <p>Please try again by lowering the speed.</p>
Adjust the Tightness of the Timing Belts	<p>Contact our customer service for instructions on adjusting the tightness of the X-axis and Y-axis timing belts so that the laser module can move smoothly.</p>
Checking the Stability of the Material	<p>If the material is too light, the gas coming out of the air nozzle may nudge the material, causing a deviated image.</p> <p>Use the material clamp or tape to fix the material before processing.</p>
Check the Material Distance/Thickness Value	<p>If the air nozzle hits the material because of the failure of focusing, which leads to the deviation of the image, check if the material thickness or distance is the same as the actual value.</p>



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