

# POLAR 350

## 50W DESKTOP LASER ENGRAVER

### OWNER'S MANUAL



Read Carefully Before Use  
Keep for Future Reference

# PREFACE

Thank you for choosing the OMTech Polar 350 as your new laser engraver!

Your CO<sub>2</sub> laser engraving machine is intended for personal and professional use. The Polar is a **CLASS 4** laser that must be used with great care to avoid serious property damage and severe personal injury, including burns and permanent eye damage. Never disable the preinstalled safety devices and always use your laser safely and responsibly.

Read this manual carefully before operation. It covers the details of correct installation, adjustment, maintenance, and—most importantly—safe operation of your new laser. It is intended to be used in conjunction with your engraving software manual, as the software not only provides image design and conversion but also serves as the main interface to the laser settings and machine controls. You and any other users of this device should thoroughly understand **BOTH** manuals before attempting to operate the laser.

Keep both manuals for future reference and provide them to **ANYONE** who will install, operate, maintain, or repair this machine. Both manuals should be included if this device is given or sold to a third party.

If you have any questions after reading these manuals, please contact us and our support department will address your concerns as soon as possible.

# CONTENTS

1. Introduction .....	1
1.1 General Information.....	1
1.2 Symbol Guide.....	2
1.3 Designated Use .....	2
1.4 Technical Specifications .....	3
1.5 Components.....	4
2. Safety Information.....	8
2.1 Disclaimer .....	8
2.2 General Safety.....	8
2.3 Laser Safety .....	9
2.4 Electrical Safety.....	10
2.5 Material Safety.....	10
3. Installation.....	12
3.1 Overview.....	12
3.2 Location Selection .....	12
3.3 Unpacking.....	13
3.4 Exhaust System .....	13
3.5 Main Power .....	14
3.6 Cooling System.....	14
3.7 Air Assist .....	14
3.8 Control Computer.....	14
3.9 Wifi .....	15
3.10 Initial Testing.....	15
3.11 Security.....	16
4. Operation.....	17
4.1 Overview.....	17
4.2 General Instructions.....	17
4.3 Rotary Instructions.....	19
4.4 Instructions for Specific Materials.....	19
5. Maintenance .....	22
5.1 Overview.....	22
5.2 Cleaning .....	22
5.3 Cooling System.....	24
5.4 Laser Alignment .....	24
5.5 Lubrication.....	24
5.6 Parts Replacement .....	24
5.7 Disposal Instructions.....	25
6. Contact Information .....	25

# INTRODUCTION

## 1.1 General Information

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

The Polar 350 works by emitting a powerful laser beam from a glass tube filled with carbon dioxide (CO<sub>2</sub>), nitrogen, and insulating gases; reflecting that beam off three mirrors and through a lens; and using this focused light to etch designs into certain substrates. The active laser is invisible to the human eye. This device should never be used while any cover or access panel is open to avoid potentially permanent injury. When its pass-through is used, care should be taken to avoid possible reflective rays.

The laser tube typically travels along the Y axis during engraving. The first mirror is fixed near the left end of the laser tube, the second mirror is fixed nearby, and the third mirror is attached to the laser head that travels along the X axis. The first and second mirrors are located within protective housing but, because dust is generated by the engraving process, the 2nd mirror's window, the 3rd mirror, and the focus lens require frequent cleaning.

With low intensity use, the provided laser tube has an average lifespan around 10,000 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.

The cover's viewing window naturally absorbs most reflected beams from the high infrared laser but it is **NOT** otherwise protected against it. Protective eyewear should **ALWAYS** be used by **EVERYONE** present when the laser is active. Such eyewear should be at least OD6 at the laser's main wavelength of 10.6 microns.

The integrated water cooling system must be used with this engraver to dissipate the heat produced by the laser tube. Similarly, the provided exhaust system must be used in conjunction with an external vent or dedicated air purifier to remove the dust and gases produced by the engraving process and ensure compliance with laws and regulations for workplace and environmental air quality. Never operate the engraver without both of these systems operating properly.

Note that this device broadcasts signals in the radio spectrum as part of its wireless connectivity. Special shielding or equipment may be necessary to minimize interference with emergency & licensed broadcasting, particularly in residential areas.

## 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 regarding the laser beam.



These items address similarly serious concerns regarding electricity.



These items address similarly serious concerns regarding fire hazards.



Protective eyewear should be worn by anyone nearby during use.



Nearby objects present a risk of pinching or crushing injury.



This product is sold in conformity with applicable EU regulations.



Safe and legal disposal of this product requires special considerations.

## 1.3 Designated Use

The Polar 350 is intended for use engraving signs and other consumer products on applicable substrates. This 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.

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.

Laser beams are dangerous. The manufacturer and/or seller bear(s) no responsibility and assume(s) no liability for any improper use of this device or for any damage or injury arising from such use. The operator is obliged to use this desktop laser engraver only in accordance with its designated use, the other instructions in its manuals, and all applicable local and national laws and regulations.

## 1.4 Technical Specifications

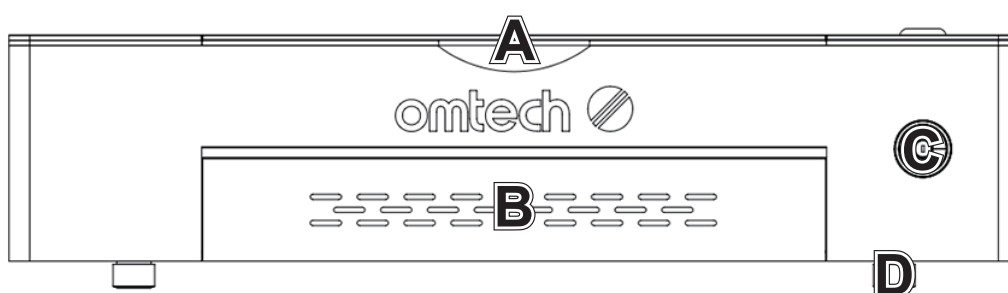
<b>Model</b>		Polar 350	
<b>Input Power</b>		110–120 V~ 60 Hz	
<b>Power Consumption</b>		600 W	
<b>Rated Power</b>		50 W	
<b>Expected Service Life</b> at <40% / 40–70% / >70% Power		11,000 / 10,000 / 8,000 hr.	
<b>Laser Wavelength</b>		10.6 $\mu\text{m}$ (10,600 nm)	
<b>Laser Tube</b>	<b>Diameter</b>	2.2 in.	5.5 cm
	<b>Length</b>	35 in.	90 cm
<b>Mirror</b>	<b>Diameter</b>	0.8 in.	20.5 mm
	<b>Thickness</b>	0.12 in.	3 mm
<b>Focus Lens</b>	<b>Diameter</b>	0.6 in.	15.5 mm
	<b>Thickness</b>	0.08 in.	2 mm
	<b>Focal Length</b>	2 in.	50.8 mm
<b>Honeycomb Workbed Dimensions</b>		22.5×13.2×0.9 in.	57.1×33.6×2.2 cm
<b>Processing Area</b>	<b>Standard (L×W)</b>	20.1×11.8 in.	510×300 mm
	<b>Trayless (L×W)</b>	13.7×8.2 in.	350×210 mm
	<b>Rotary 1 (L×D)</b>	0–9.4×2.4–2.9 in.	0–240×60–75 mm
	<b>Rotary 2 (L×D)</b>	0–9.4×1.2–2.3 in.	0–240×30–60 mm
<b>Front/Back Pass-Through Area (L×H)</b>		14.1×0.19 in.	360×5 mm
<b>Max. Processing Speed</b>		19.6 ips	500 mm/s
<b>Rec. Processing Acceleration</b>	<b>X Axis</b>	196 ips <sup>2</sup>	5000 mm/s <sup>2</sup>
	<b>Y Axis</b>	118 ips <sup>2</sup>	3000 mm/s <sup>2</sup>
<b>Max. Material Thickness</b>	<b>Standard</b>	0.67 in.	1.7 cm
	<b>Without Workbed</b>	2 in.	5.1 cm
<b>Max. Resolution</b>		1000 dpi	
<b>Min. Letter Size</b>		0.04×0.04 in.	1×1 mm
<b>Mainboard</b>		Ruida 6442S (RDC6442S-B)	
<b>Integrated Water Pump</b>	<b>Capacity</b>	1.6 qt.	1.5 L
	<b>Flow Rate</b>	142 gph	540 L/hr.
<b>Integrated Air Assist</b>	<b>Port Diameter</b>	0.4 in.	10 mm
	<b>Air Flow</b>	18.8 cfm	533 L/min.
<b>Integrated Digital Camera</b>	<b>Max. Resolution</b>	5 MP	
	<b>Field of View</b>	20.1×11.8 in.	51×30 cm
	<b>Accuracy</b>	±0.04 in.	±1 mm
<b>External Exhaust Fan</b>	<b>Rated Power</b>	60 W	
	<b>Port Diameter</b>	5.9 in.	150 mm
	<b>Air Flow</b>	282/353 cfm	480/600 m <sup>3</sup> /hr.
<b>Req. Operating Environment</b>	<b>Humidity Range</b>	20–85%	
	<b>Temp. Range</b>	40–104°F	5–40°C
<b>Compatible Operating Software</b>		CADLaser, CorelLaser, LightBurn, RDWorks	
<b>Dimensions</b>		38.2×22.3×9.2 in.	97×56.5×23.4 cm
<b>Net Weight</b>		104 lb.	47 kg





- L. **Laser Head**—The laser head holds the 3rd mirror, focus lens, and air assist outlet and directs the laser beam down into your materials. Its components are normally protected by a rectangular shell that locks magnetically into place.
- M. **X-Axis Rail**—The X-axis rail supports the movement of the laser head left and right across the workbed. When using either of the rotary axes, this rail should be positioned to connect the matching arrows.
- N. **Tray Interlock**—This switch stops your laser when the debris tray is removed. For pass-through and rotary engraving, close this switch using the nearby bracket.
- O. **Water Pump**—This pump circulates your water or laser-safe coolant through the laser tube to keep it cool and stable.
- P. **LED Light Strips**—These integrated lights help keep your workbed easy to see.
- Q. **Camera**—This fisheye camera helps you position your designs precisely.
- R. **Water Tank**—This tank helps keep your laser tube cool and stable. It arrives full of OMTech antifreeze but can also be replaced with distilled water.
- S. **Mainboard**—This circuit board located under the left panel controls the engraving process, responding to commands from your computer’s engraving software. It has a total memory of 128 MB, about 95 MB of which is available to store designs.
- T. **Honeycomb Workbed**—The workbed supports your material up to 0.59 inches (15 mm) thick while allowing effective airflow. It can also be removed to fit thicker materials or to use the rotary axes. There are vertical and horizontal inch and cm rulers on opposite sides of the bed.
- U. **Start Button and Laser Status**—This button can be used to pause and restart engraving or to repeat the previously loaded design with its former settings. To start a new design or engrave with adjusted settings, use your software’s commands. The ring around the button changes color to indicate your engraver’s current status:

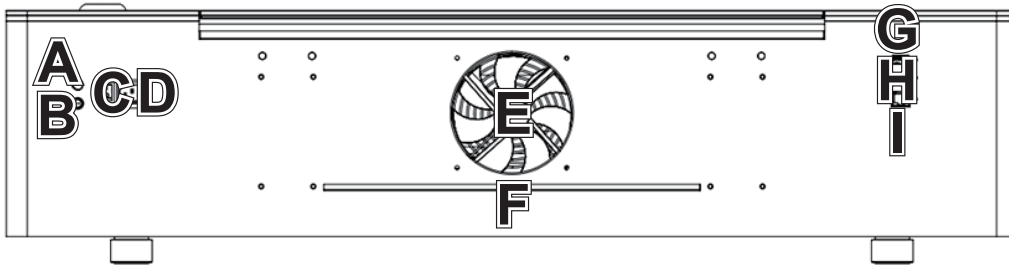
Status Color	Meaning
Blue	Active Laser
Green	Ready to Work
Red	Error or Malfunction



### Front View

- A. **Cover**—This acrylic window allows you to monitor the engraving process, absorbing most reflected laser beams. However, always use protective eyewear when observing the active laser and never stare at it for extended periods.
- B. **Debris Tray**—This tray is easily removable to clean debris after use and to install or remove the honeycomb workbed. It can also be left open to function as the front pass-through.
- C. **Laser Key**—This lock turns the laser power supply on and off, helping ensure only approved operators can use your laser.
- D. **Legs**—These padded legs help avoid any damage to your table or counter.



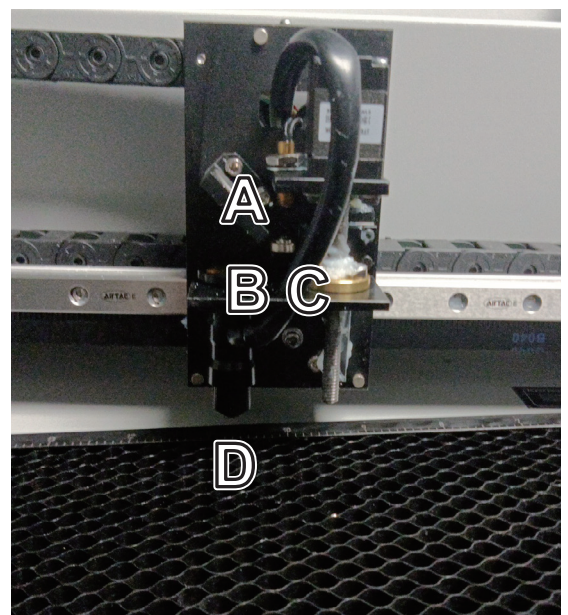


## Rear View

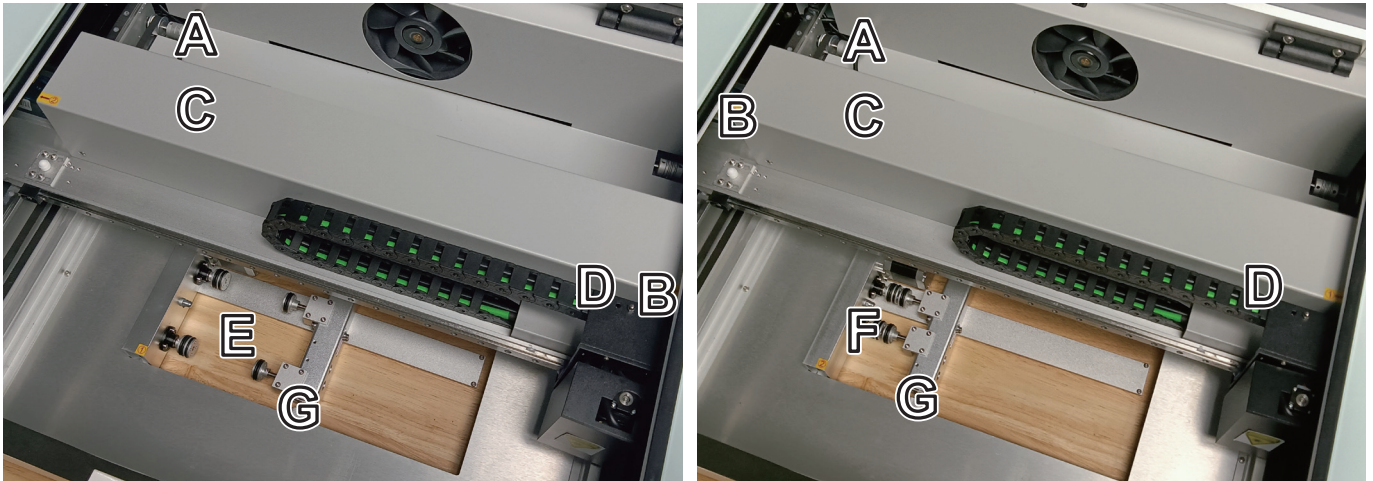
- A. **Beam Attenuator**—This dial provides a master power control for your engraver. It should be turned completely clockwise to enable your software to use the engraver’s full power range.
- B. **Remote Interlock Connector**—This port functions as a second key necessary to activate the laser tube. Insert the provided switch to enable the laser or remove it to completely disable the laser.
- C. **Power Switch**—This switch turns on the engraver’s mainboard, cooling system, LED lighting, and wireless card and places the exhaust fan and air assist into standby mode, ready to activate with the laser. It should always be turned off between sessions.
- D. **Power Socket**—This socket connects to your main power supply and grounds your machine’s electronic components.
- E. **Exhaust Fan**—This fan pulls out gases and airborne debris from the workbed, sending it through your vent to a window or air purifier.
- F. **Rear Pass-Through**—This door can be unsealed to allow larger pieces of material to be fed into or across the workbed. Additional care must be taken to avoid exposure to the laser beam and its reflections when it is open.
- G. **Camera Port**—This USB port connects the engraver’s camera to your control computer and engraving software.
- H. **Computer Port**—This USB port connects the engraver’s mainboard to your control computer and engraving software.
- I. **Ethernet Port**—This port allows a fast connection between the engraver’s mainboard and your control computer either directly or via the internet.

## Laser Head

- A. **3rd Mirror**—This fixed mirror transfers the laser from the 2nd mirror at the end of the X-axis rail downward to the focus lens.
- B. **Focus Lens**—This 15.5 mm lens directs and focuses the laser beam to its point of contact with your material.
- C. **Air Assist**—This tube provides the pressurized air from its compressor to kill sparks and minimize dust and gases.
- D. **Laser Beam**—The engraving laser itself is invisible but highly dangerous. Avoid any direct exposure to your skin or eyes.



## Rotary Axes



- A. Rotary Aviation Plug**—This plug should be covered during normal engraving. When you will use the rotary axes, the 4-pin connection will power and direct the rotary motor.
- B. Alignment Arrows**—These arrows indicate the correct position of the laser and the X-axis rail for use with Rotary Axis 1 (on the right) or Rotary Axis 2 (on the left).
- C. Rotary Switches (covered)**—These switches redirect power and control from the Y-axis motors to the rotary axis connection and back again.
- D. Tray Interlock**—This switch must be held closed by the nearby bracket during rotary engraving. Remember to reenble the switch by removing the bracket after your work.
- E. Rotary Axis 1**—This four-wheel rotary axis is installed into the bottom left corner of the open bay as shown. The arrow at the end of the laser tube casing should be aligned with the arrow marked 1 on the right side.
- F. Rotary Axis 2**—This four-wheel rotary axis is also installed into the bottom left corner of the open bay as shown but the arrow at the end of the laser tube casing should be aligned with the arrow marked 2 on the left side.
- G. Height Adjustment Knob**—Turn this knob to adjust the height of the right-side wheels when it is necessary to create a level surface while engraving conical objects.

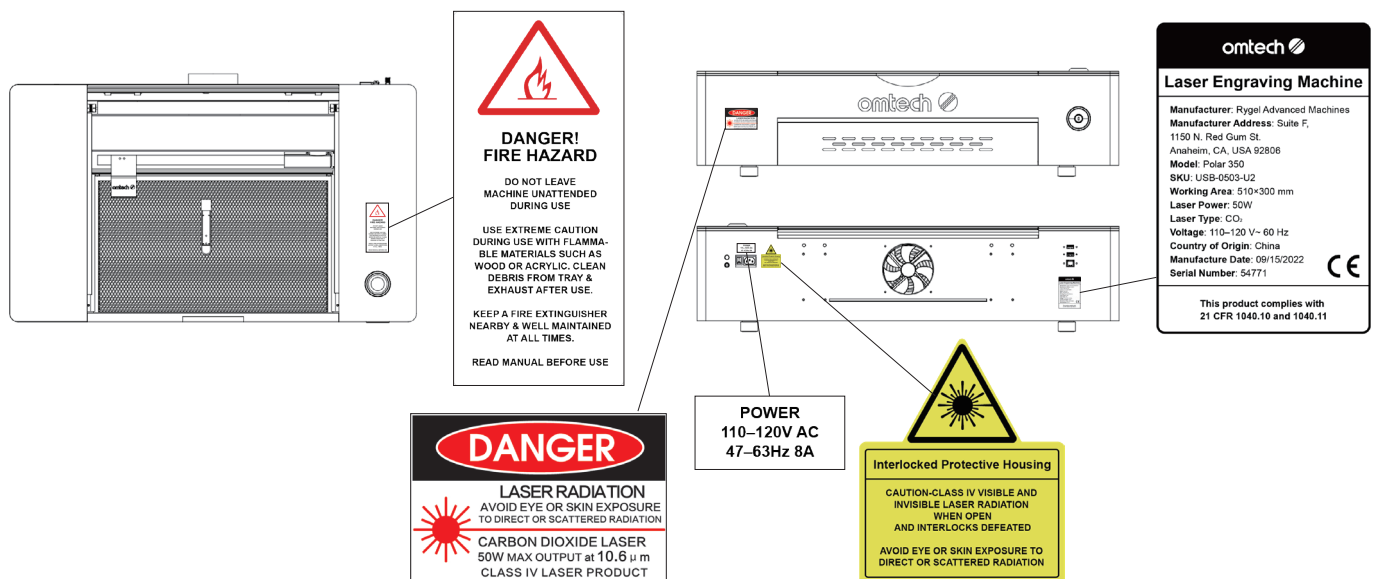
# SAFETY INFORMATION

## 2.1 Disclaimer

Your Polar may differ somewhat from those shown in this manual due to options, updates, etc. Please contact us if your engraving machine came with an outdated manual or if you have any other questions.

## 2.2 General Safety Instructions

- Your Polar 350 should come with warning labels in the following locations:



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

- Use this laser engraving device only in accordance with all applicable local and national laws and regulations.

In the United States, the Polar's wireless network is a certified transmitter module that emits radio signals in compliance with 47 CFR 15 for commercial locations but may require operators to provide additional equipment in residential areas to avoid interfering with emergency and FCC licensed broadcasts. Similarly, the Safe Use of Lasers (Z136) standards published by the American National Standards Institute do not have the force of law, but adherence to its provisions may be required by some companies or local authorities to minimize risk and liability. In particular, it may be necessary in commercial settings to formally designate a laser safety officer, to post warning signs in areas with active lasers, and to document that all operators of laser equipment have been properly trained.

- Use this device only in accordance with this instruction manual and the manual for the engraving software included with it. Only allow this device 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 device if it is ever given or sold to a third party.
- DO NOT** leave this device unattended during operation. Observe the device throughout 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 device is **FULLY** turned off 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 device.
- Any untrained personnel who might be near the device 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, water hose, or other flame retardant system nearby in case of accidents. Ensure that the local fire department's phone number is clearly 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.



## 2.3 Laser Safety Instructions

The Polar 350 uses an invisible **CLASS 4 LASER**, the strongest and most dangerous class of laser available for public use. Used or modified without care, it can cause seriously property damage and severe 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 gases during processing
- Direct exposure to the laser will cause bodily harm including serious burns and irreparable eye damage

As such,

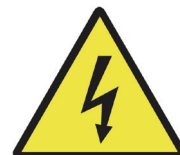
- **DO NOT** modify or disable this device's provided safety features except as specifically instructed elsewhere in this manual. Do not modify or disassemble the laser and do not use the laser if it has been modified or disassembled by anyone except trained and skilled professionals. Do not activate the laser without its focus lens. Dangerous radiation exposure and other injury may result from the use of adjusted, modified, or otherwise incompatible equipment.
- **NEVER** leave any part of the Polar open during operation except (when needed) the pass-through doors. 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 using the pass-through doors or otherwise risking exposure to the laser beam, take measures to protect yourself from potentially reflected laser beams including the use of personal protective equipment.
- **DO NOT** look or allow others to look directly at the active laser even when the cover is closed. The viewing window naturally absorbs most reflected beams from the high infrared laser but is **NOT** otherwise protected against it. **EVERYONE** nearby during use should wear eye protection specially designed to filter the specific wavelength of your engraver's laser with an optical density (OD) of 6 or greater. Do not stare or allow others to stare continuously at the active laser even when using protective eyewear.
- **ONLY** use this engraver if its automatic shutoffs are working properly. Never disable any of these shutoffs except as specifically instructed elsewhere in this manual. When you first get this engraver and if you subsequently notice any problems, test them (see below) before undertaking any other work. Do not continue use if the shutoffs do not occur. Turn off the device and contact technical support or your repair service.
- **ONLY** use this engraver in a flat and stable location. Using it on an unstable surface or at a tilted position may cause the laser to deviate from its intended path or permanently damage internal components of the device.



- **DO NOT** ever under **ANY** circumstances use this laser engraver if the water cooling system is not working properly. Always 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 the system pauses operation because the coolant has reached its maximum temperature of 122°F (50°C), allow at least thirty minutes for the system to cool before resuming operation.
- **DO NOT** use generic coolant or 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 below the laser or nearby where they might 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 for working the materials described in the Material Safety section of this manual. 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.

## 2.4 Electrical Safety Instructions

- **ONLY** use this device with a compatible, stable, and grounded power supply with less than 5% fluctuation in its voltage. Do not use with an ungrounded 3 to 2 prong adapter. The device's grounding should be checked regularly for any damage to the line or loose connections.
- **DO NOT** connect other devices to the same circuit, as the laser system may require its full amperage. Do not use with standard extension cords or power strips. Use only surge protectors rated over 2000J.
- The work area around this laser engraving device should be kept dry, well ventilated, and environmentally controlled to keep the ambient temperature between 40–104°F (5–40°C). For best results, keep the temperature at 75°F (25°C) or below. The ambient humidity should be between 20–85%.
- Adjustment, maintenance, and repair of the electrical components of this device 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 this device when it is turned off, disconnected from its power supply, and fully cooled.



## 2.5 Material Safety Instructions

- Users of this laser engraving machine are responsible for confirming that 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 device to process polyvinyl chloride (PVC), teflon, or other halogen containing materials under any circumstances.
- Users of this laser engraver are responsible for ensuring that every person present during operation has sufficient PPE to avoid the 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.
- **DO NOT** operate the laser without its air assist.
- Users of this laser engraver are responsible for ensuring that otherwise safe dust and debris created during use is fully cleaned afterwards. Dust allowed to build up on the surfaces of the main bay and the tray under it is a fire hazard that can easily be ignited by the heat of the laser.

- **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 pipe malfunctions.
- Users must exercise special caution when working with conductive materials as buildup of their dust and ambient particles 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:

- Cardboard
- Ceramics, including Dishes, Tile, etc.
- Glass
- Leather
- Paper & Paperboard
- Some Plastics
  - Nylon (Polyamide, PA, etc.)
  - Polyethylene (PE) and High-Density Polyethylene (HDPE, PEHD, etc.)
  - Biaxially-Oriented Polyethylene Terephthalate (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 and Acrylonitrile Butadiene Styrene (ABS)
- Rubber
- Stone, including Marble, Granite, etc.
- Textiles, including Cotton, Suede, Felt, Hemp, etc.
- Wood, including Cork, MDF, Plywood, Balsa, Birch, Cherry, Oak, Poplar, etc.

See §4.4 for recommended parameters for the most commonly engraved materials.

This machine **CANNOT** be used with the following materials or with any materials which include them:

- 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, Cintra, 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 device, seek out its material safety data sheet (MSDS). Pay especial attention to information about safety, toxicity, corrosiveness, reflectivity, and reaction(s) to high heat. Alternatively, contact our support department for further guidance.

# INSTALLATION

## 3.1 Installation Overview

A complete working system consists of the laser engraving machine, its integrated air assist and water pump, its vent and exhaust fan, its control computer, all applicable connection cables, the interlock connector, and the laser key. The cabinet can receive designs and commands from the control computer directly from its USB cable or remotely from its wireless network or ethernet cable. It can also store some design files on its own circuit board. The designs can be applied to flat surfaces resting on the honeycomb workbed or to round surfaces supported on one of the provided rotary devices. Users can configure other additional accessories (such as a fume extractor) to suit their needs.



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

Please 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.

## 3.2 Location Selection

Before you install your engraver, select an appropriate location for its use. Be sure that it meets all of the requirements discussed in the Safety Information above.


The location should be stable, level, dry, and climate controlled to ensure an ambient temperature of 40–104°F (5–40°C) and an ambient humidity of 20–85%. 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 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 construction of a dedicated ventilation system. It should be away from children; combustible, flammable, explosive, or corrosive materials; and sensitive EMI devices. 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.

It is highly recommended to have extra space nearby to avoid placing any object on or directly adjacent to the machine, which could become a fire or laser hazard.



## 3.3 Unpacking Your Engraver

Your new Polar 350 arrives in a wooden crate with its accessories (including this manual) packaged inside the main bay. You should have placed the crate 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.

- Step 1** Open the top of the crate. Remove the honeycomb workbed and surrounding foam insulation.
- Step 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.
- Step 3** Carefully remove the straps and plastic packaging from around the engraver.
- Step 4** Open the cover and confirm that you have received all of the following accessories: Two 4-wheel rotary axes with their aviator connection cords; a duct fan, its wired and remote controls, an adapter ring, 2 exhaust pipes, and 3 hose clamps; five 3 mm basswood, cardboard, and acrylic blanks; a main power cord; an Ethernet cable; two USB cords; a USB flash drive with engraving software; a storage box with cotton swabs, tape, 2 rulers, 2 laser keys, the interlock connector, and sets of hex wrenches, target discs, and O-rings; and this manual.
- Step 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.
- Step 6** Pull out the debris tray. The honeycomb bed has inch and metric rulers on opposite sides. Place the one you prefer to use facing up and slide it into place. 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.
- Step 7** 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.

## 3.4 Exhaust System Installation

The provided duct pipes extend 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.

Slide the two small hose clamps onto the smaller exhaust pipe. Attach one end directly onto the rim surrounding the exhaust fan behind the laser. Use a screwdriver to tighten one of the clamps around this connection. Attach the other end of the pipe to the inlet side of the 60W duct fan using the provided adapter ring. Tighten the second clamp around this connection.

Slide the large hose clamp onto the larger exhaust pipe. Attach one end of the pipe to the outlet side of the duct fan and tighten the clamp around this connection. Attach the other end of the pipe to a fume extractor or vent it into the open air outside your work area.

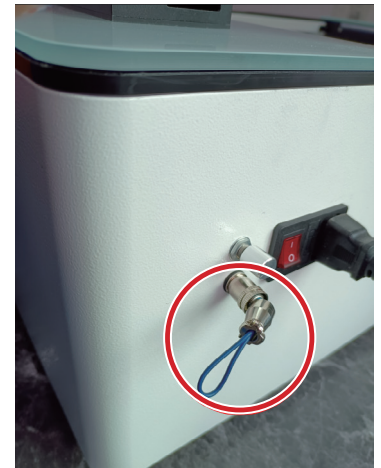
Connect the duct fan to power, ideally on a separate circuit from the one that will be used to power the laser itself. Turn it on and confirm that it operates at both speeds.



**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 that can produce corrosive, hazardous, or even deadly fumes.

### 3.5 Main Power Connection

Confirm that the voltage on the label above the laser's power socket matches your local power supply. Insert the interlock connector and power cord into their sockets on the rear side of the machine. (If the interlock connector does not fit, pull back its outer casing, align its holes with the pins, and try again.) Connect the other end of the power cord directly to a grounded outlet or to a surge protector rated over 2000J that is itself connected to a grounded outlet. Do not connect the other end to any standard extension cord, power strip, or ungrounded adapter. For best results, have a trained technician verify that your power supply has less than 5% fluctuation and that your outlet is properly grounded with less than 5Ω resistance along the line.



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.

### 3.6 Cooling System Inspection



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.

Open the cover and confirm that the plastic tank to the right of your main bay is full. The integrated water pump should arrive with about 1.6 quarts (1.5L) of OMTech coolant already in place. This should not require replacement during the first year of service, but refill it if the tank ever seems below two-thirds full before activation.

Flip the engraver's main power switch, insert and turn the laser key, and confirm that the coolant begins to flow out of its tank, through the laser tube, and back into the tank.

### 3.7 Air Assist Inspection

Your air assist should also arrive preinstalled and correctly wired. Confirm that pressurized air begins to blow from the laser head when the engraver is connected to power and turned on.



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.

### 3.8 Control Computer Connection

Your computer comes with a copy of Ruida Technology's RDWorks software and a digital copy of its official instruction manual, both located on the USB flash disk provided with the other accessories. You can also download a free copy of the most recent version of RDWorks from our website at [www.omtechlaser.com/pages/software-download](http://www.omtechlaser.com/pages/software-download) or from Ruida's own website at [www.rdacs.com/en](http://www.rdacs.com/en). See the software manual for details on the requirements for the control computer.

To configure your control computer and software for the Polar 350,

1. Connect your computer to the engraver using the provided Ethernet cable or one of the provided USB cables. Use the other USB cable to connect your computer to the port marked "Camera".

2. Connect the USB flash drive to a third port or to a USB hub connected to your computer. Alternatively, move all of its files to a folder on your computer.
3. Install and open RDWorks on your control computer.
4. In RDWorks, go to **Model** (ALT+M) on the main toolbar and select “RDC6442S”.
5. Go to **File** (ALT+F) on the main toolbar and select **Vendor Settings**. Enter the default password `rd8888`. Select **Open**. Load the file `Manufacturer _ parameters.RDVSet` from the USB or the folder you created on your computer.
6. Go to **Config** (ALT+S) and select **System Settings**. Select **Import Soft Para**. Go to the USB or your folder and load the file `Software _ parameter.cfg`.
7. On the System Work Platform on the upper right side of the main screen, change the tab from **Work** to **User**. Select **Open**. Go to the USB or your folder and load the file `User _ parameters.RDUSet`.
8. Configure the camera by going to **Laser Work** at the lower right and changing the **Position** from “Current Position” to “Absolute Coordinates”.
9. On the Canvas Tools toolbar, click the unlabeled radio box and enable the canvas function and controls. Click on the unlabeled gear icon nearby to open the **Canvas Para Settings** submenu. Select **Import Calibration** and go to the USB or your folder. Load the file `Camera _ calibration _ file.calx`.

Familiarize yourself with the software’s image design features and laser control settings before using it to operate the laser. For help configuring your engraver for use with LightBurn or other engraving software, contact our customer support team for complete details.

## 3.9 Wifi Configuration

Check your local wifi networks to see if “Polar350” already appears. If so, log into it using the default password `123456abc`.

If it does not appear, you may need to reconfigure your own device’s TCP/IP address. The default address of the Polar 350’s wireless network is `192.168.1.100`. You will need to set your computer’s wireless network card to use a similar but not identical address. Use `192.168.1` for the first three sections and choose a unique value for the last section. Typically any value from 2–252 except 47 and 100 should be ok but avoid any other values that are already being used by your other networked devices. Use the subnet mask `255.255.255.0`.

Enable wireless control in RDWorks by going to **Device** at the lower right. If you cannot find it, go to **View** (ALT+V), deselect **System Work Platform** to remove it from view, and make sure that **Process Control Bar** is selected for viewing. If **Device** is still not visible at the lower right, use your mouse to raise the **Laser Work** menu until **Device** becomes visible. Click **Setting**. In the submenu that will open, select **Add** on the bottom left. Toggle the selection to **Web**, enter the IP address `192.168.1.100` if it is not automatically generated, and select **OK**. The wifi connection should automatically be set for use. Click **Exit**, confirming and saving your changes. You can now use **Device**’s drop down menu to switch between using the cable connection (“USB:Auto”) and the wireless connection (“IP:192.168.1.100”).

## 3.10 Interlock Testing

Because of the risk of blindness, burns, and other injury from direct exposure to the invisible engraving beam, this device shuts off the laser automatically when parts of its protective housing are opened.

### Cover Shutoffs (Interlock)

You should test that the cover shutoffs activate properly before conducting any other work on your machine. Turn on the engraver and duct fan. Confirm that the cooling system, air assist, and exhaust fan

have activated. Place a piece of laserable scrap material onto the workbed, insert and turn the laser key, and close the cover. Create or load a simple design into RDWorks and begin engraving. Taking care not to expose yourself to seeing or being hit by any possible reflected laser light, open the cover as little as possible. The laser should pause automatically and then restart once the cover is closed again. 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.

### **Tray Shutoff (Interlock)**

After ensuring that the cover protection works, you should also test that the tray shutoff activates. Perform the same procedure as before but, instead of opening the cover, open the debris tray. 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.

This is the only safety feature that should ever be circumvented. You will need to disable this switch—located at the back right side of the main bay near the ammeter—when engraving thick materials or while using the front pass-through or the rotary axes. To do so, remove the debris tray and the workbed. Move the 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.

### **Rear Key (Interlock Connector)**

After ensuring that the cover and tray interlocks work properly, you should test that the rear key functions correctly. Perform the same procedure as before but, instead of opening the cover or tray, remove the interlock connector from its socket beside the power switch. The laser should stop completely. If it continues to engrave the design without the rear 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.

### **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. This can be tested by crimping or tying the water hoses and attempting to fire the laser. If you perform this test, be careful not to damage the hoses themselves and to only briefly activate the laser. If the laser does 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 does not fire, 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.

## **3.11 Security**

For your own safety and that of passersby, this engraver requires two keys to provide power to the laser tube, the interlock connector at the back of the machine and the laser power key in the front. Operators should always remove at least one of these 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.

# OPERATION

## 4.1 Operation Overview



Operate the Polar 350 only in accordance with all the instructions provided in this manual. Failure to follow the proper guidelines detailed here can result in property damage and personal injury.

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 the Safety Information above), the separate software manual, and any and all warnings provided on the machine itself.

## 4.2 General Operation Instructions

- Step 1** Create your design that you'd like to engrave. You can do this directly in your engraving software or use any other graphics program.
- Step 2** Turn on your duct fan and any fume extractor or other ventilation equipment.
- Step 3** Insert the interlock connector—if you don't normally leave it in place—and turn on your engraver using its rear power switch and the laser key. Put on your protective laser glasses and any other PPE necessary for your material. Confirm that the cooling system, air assist, exhaust fan, and internal lights have activated.
- Step 4** Confirm that your control computer has a connection to the Polar, either directly through the provided cables or wifi connection or via the internet. Load your design into your engraving software.
- Step 5** Confirm the thickness of your material with the provided ruler and place a sample piece into the main bay. 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. Confirm that the rotary switch is flipped down to its standard position and then close the cover.

For pieces thicker than 0.67 inches (17 mm), you will need to open the tray and remove the honeycomb workbed to provide the extra space. For pieces longer than 20 inches (510 mm), you should open the rear pass-through door, remove the debris tray and workbed, hold the tray interlock switch back using the adjacent metal bracket, and replace the workbed.



**DO NOT** insert anything through the pass-through doors other than your material. As you work, confirm the ventilation system is removing all dust and fumes. If it cannot, cease use of the pass-through for that material unless sufficient PPE is worn by everyone nearby.

For round pieces, you will need to use a rotary axis (see §4.3 below).

- Step 6** Focus your laser using the **Offset** parameter in your software, located on the **Test** tab of the System Work Plat on the upper right side of the main interface. For the 2-inch focus lens, this value will be 17 minus the thickness of your material in mm:

Material Thickness		Offset Value
Inches	mm	
0	0.000	17.000
0.1	2.540	14.460
1/8	3.175	13.825
0.2	5.080	11.920
1/4	6.350	10.650
0.3	7.620	9.380
3/8	9.525	7.475
0.4	10.160	6.840
1/2	12.700	4.300
0.59	15.000	2.000

These are the values for materials passed through or placed at the level of the workbed. For thicker materials, find their height relative to the bed's usual level, roughly 2¾ in. (70 mm) above the bottom of the laser's support legs. Save your changes by pressing **Z-** on the same tab.

**Step 7** Adjust your software's parameters to suit your project. 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.

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 without increasing its raw power, increase the amount of energy per unit area by 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.

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.

**Step 8** Begin engraving your design by clicking the **Start** button in **Laser Work** on the lower right side of the software's main interface. Watch for possible issues like sparks or fires using the camera view. Do not stare continuously at the active laser even through your protective eyewear. Be prepared to quickly extinguish a fire if necessary. If any dust or fumes begin to build up within the main bay, increase the power of the duct fan or pause work periodically to allow it to clear the air.

You can pause and resume work by pressing the **Start** button on the right side of the engraver. Once the laser has stopped, examine the quality of your first run. Adjust the parameters in your software as necessary and begin your real work in a different location or on a different piece of material. You can also use the engraver's **Start** button to repeat your last design without applying any changes.

If your engraver stops during repetitive engraving and cutting, the cooling system may have reached 122°F (50°C) and automatically paused work. Resume work only after the system has had time to adequately cool. If possible, use lower power settings while reducing speed or increasing the number of times your design is processed.

**Step 9** When you have finished your project, close your engraving software. 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. Turn off the engraver using the laser key and the main power switch and then turn off the external fan. For best results, fully unplug your engraver or turn off its intermediary surge protector.

**Step 10** Open the cover and remove any dust or debris buildup from the workbed and the various surfaces within the bay. Remove the debris tray, empty and clean it, and replace it.



## 4.3 Rotary Operation Instructions

The Polar 350 comes with two separate 4-wheel rotary axis devices to engrave round and cylindrical surfaces. Use Rotary Axis 1 for larger items and use 2 for smaller ones.

- Step 1** Create your design that you'd like to engrave. You can do this directly in your engraving software or use any other graphics program.
- Step 2** Remove the debris tray and the honeycomb workbed. Set them aside where they will not be damaged or fall over. Gently move the laser tube and X-axis rail forward. Use the nearby bracket to hold the tray interlock switch closed.
- Step 3** Flip the rotary switch up towards the back of the main bay to deactivate the Y axis motors and control signals and activate the rotary aviation socket.
- Step 4** Uncover the rotary aviation socket and connect one of the rotary cables. You will need to pull back its outer sheath while aligning the 4 holes to their pins. Connect the other end of the cable to the motor of the rotary you will be using.
- Step 5** Place your rotary axis in the open bay so that its number label is in the front left corner and its support frame is flush with the left side of the open bay.
- Step 6** Gently move the laser tube and X-axis rail back so that its arrow label is properly aligned.

When you are using Rotary Axis 1, align the **1** arrow label on the laser tube casing with the arrow label on the **RIGHT** side of the bay.

When you are using Rotary Axis 2, align the **2** arrow label on the laser tube casing with the arrow label on the **LEFT** side of the bay.

- Step 7** Place your object carefully onto the rotary axis and measure the distance from the upper surface of the rotary base to the upper surface of your object. The **Offset** value for the 2-inch focus lens will be 86.2 minus this distance in mm.

Follow the other steps as with regular engraving. When you are finished, remember to reenable the tray interlock.

## 4.4 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.

**Average Engraving Settings**

Material		Acrylic	Basswood	Canvas	Cardboard	Leather	MDF	Rubber
Engraving	Power (W)	25	25	12.5	22.5	15	20	17.5
		50%	50%	25%	45%	30%	40%	35%
	Speed (mm/s)	500	500	500	500	500	500	500
		100%	100%	100%	100%	100%	100%	100%
Cutting	Power (W)	45	45	30	45	45	45	N/A
		90%	90%	60%	90%	90%	90%	N/A
	Speed (mm/s)	35	65	350	200	80	30	N/A
		7%	13%	70%	40%	16%	6%	N/A
Rec. Thickness (mm)		3	3	0.2	2	1.5	3	3
Resolution (dpi)		400	400	300	400	400	300	400



## **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 risk 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 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.

## **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 marking. 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 afterwards.

## **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.

## **Metal**

CO<sub>2</sub> 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 CO<sub>2</sub> 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.

## **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 of the possibility of fire, as well as the dust produced in repetitive applications.

## **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, 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.

## **Rubber**

The various compositions and densities of rubber cause slightly varying engraving depth. Testing various settings on sample pieces of your specific rubber is highly recommended for 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.

## **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.

## **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.

## **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 soft woods 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 produce a poor effect at any settings. Hard woods 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 its 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 and yew can also cause nausea and cardiac problems in high enough amounts.

# MAINTENANCE

## 5.1 Maintenance Overview



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 device and disconnect it from power. 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 device.

- 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.
- The workbed must be cleaned and the waste bin emptied on a daily basis.
- The lenses of the 1st and 2nd mirror housing, the 3rd mirror, the focus lens, and camera must be checked every day and cleaned if required.
- The exhaust system must be checked every week and cleaned if required.
- 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.

## 5.2 Cleaning



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

### Cleaning the Camera, Mirrors, and Focus Lens



Take care to **NEVER** touch the surface of any of these windows, mirrors, or lenses with your finger. Avoid pressing hard enough to cause scratches by grinding debris into the lenses.

The 1st and 2nd mirrors are permanently aligned within a protective housing and should not require adjustment or cleaning. The 3rd mirror and focus lens are held within the laser head's protective shell.

Clean the lenses of the protective housing's window using a laser-safe microfiber cloth or a cotton swab doused in alcohol or a laser-safe cleaning solution. Clean with gentle circular motions.

To expose the interior of the laser head, gently remove its shell from the magnets that hold it in place. Clean the lens of the 3rd mirror and both sides of the focus lens in the same way as the 1st and 2nd mirror's windows. Gently remove any other dust or debris from other components inside the laser head and wipe the shell's holes clean as well before carefully replacing it, allowing the magnets to grab hold and pull it back into place.

Clean the camera lens in the same way. If any permanent spots or debris appear under the camera's glass lens, it cannot be wiped clean and will require replacing the camera itself. Contact customer or technical support for details.

## 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. Clean the viewing window with mild cleansers and a lens or 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. Clean the interior of the main bay thoroughly, removing any debris particles or deposits. Paper towels and window cleaner are recommended.

When it is necessary to clean the right or left sides of the main bay thoroughly, the plastic panels that cover them can be removed for easier access. Turn off and unplug the engraver. Open the cover and disconnect all the electronic items on each side. Removing the left panel requires unplugging its LED light. Removing the right panel requires unplugging its LED light as well as the induction switch and key line.



Remove the front and rear screws and remove the panels. Replace them using the same screws and then restore the electrical connections.

## Cleaning the Cooling System



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

Your coolant tank should be shielded from ambient dust created during work. If your coolant ever becomes visibly dirty, discontinue work. The debris in the water will reduce its cooling efficiency, can heat up itself, and can damage the cooling pipes. Remove the right panel following the instructions above and use a baster or fluid extractor to remove the contaminated coolant. If the coolant is especially polluted, use a funnel to refill the tank with clean water, return the engraver to working order, run the system for a few minutes, and then immediately extract the water again to remove other impurities from the line. Use a funnel to refill the tank with clean distilled water or laser-safe coolant, reseal the tank, restore the right panel, and resume use.

If your coolant remains visibly clean at all times, it is still recommended that you clean the water tank at least once a year as a precaution, replacing the fluid as you do so.

## 5.3 Cooling System Maintenance



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

In addition to the regular cleaning above, check that the tank is at least two-thirds full of coolant or clean water before and after each use. If the tank ever begins to run low, use a funnel and tube to add more distilled water or laser-safe coolant or remove the right panel and add the fluid directly with a funnel.

## 5.4 Laser Path Alignment

The Polar 350 goes through a complete beam alignment before shipping and its design should keep your mirrors locked into their proper positions at all times. If you wish to test the alignment by using the laser to mark pieces of tape along its path to your material, remember to never place the tape directly on any mirrors or lenses, to never use power levels above 15% to mark the tape, and to never disable the cover's interlock switches during your testing.

If you ever find that your mirrors are out of alignment, contact our technical support team to correct the problem.

## 5.5 Rail Lubrication

For best results, clean and lubricate the engraver's guide rails every two weeks. Turn off the laser engraver. Gently move the laser head out of the way. Wipe away all dust and debris along the X and Y axis rails with a dry cotton cloth until they are shiny and clean. Do the same to the Z axis screws. Lubricate both the rails and screws with white lithium grease. Gently move the laser head and X axis to distribute the lubricant evenly along both rails and raise and lower the bed to distribute the lubricant evenly along the screws.

## 5.6 Parts Replacement

The 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.

## 5.7 Disposal 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. Contact your local authorities or dealer for disposal and recycling advice.

## CONTACT US

Thank you for choosing the Polar 350!

Register the warranty for your new laser by contacting us at **support@omtechlaser.com** or calling our support line at (949) 539-0458 between 8 am and 4:30 pm PST Monday to Friday.

For a .pdf copy of the latest version of this manual, visit **omtechlaser.com** or use the appropriate app on your smartphone or other device to scan the QR code to the right.

Join the OMTech community at our official laser group on Facebook or visit the company forums at our website! For helpful hints and instructions videos, visit our channel on YouTube and, if you encounter any problem regarding your engraver, do not hesitate to contact our support team at **techsupport@omtechlaser.com**.



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