

The Laser Engraver Buyer's Guide

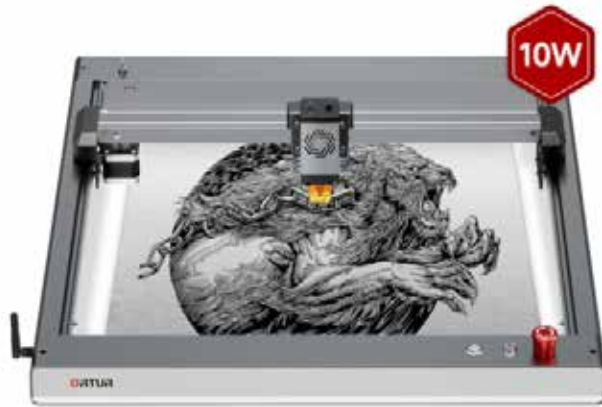
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What is a laser engraver?

A laser engraver is a powerful tool consisting of a computer-controlled laser module, composed of an intensely focused laser beam, that is directed by mirrors and lenses. The beam, which can burn, vaporize, or cut, can be moved in precise increments along an X and a Y axis controlled by timing belts, which are actuated by precision stepper motors. The laser movements enable the user to engrave detailed designs and text onto a wide variety of materials, including wood, metal, plastic, and other surfaces. It can also be used to cut these materials, as well as paper, cardboard, fabric, and dark-colored acrylic.



The Ortur Laser Master 3, on the left, and the xTool D1, on the right, are representative of laser engraver/cutters currently on the market. Credit: Ortur, xTool.

Why buy a laser engraver?

A laser engraver provides the means to produce a wide variety of projects for crafting and hobby endeavors, as well as money-making business pursuits. Woodworkers, graphic designers, jewelry makers, leather crafters, modelmakers, clothing designers, and manufacturers of all sorts can find uses and applications for laser engraving machines.

What technology does a laser engraver use?

This guide is directed at diode laser engravers, which tend to be lower cost than CO2 lasers, but are nonetheless quite capable. Diode lasers use less power and produce less heat, making them more energy-efficient and less dependent on the need for a cooling system.

How do you assess the power of a laser engraver?

Laser engravers are evaluated on the basis of the power that they generate, in watts, not the amount of power that feeds them. Output power ratings are typically in the range of 5W to 20W, although newer laser modules are rated as high as 40W. Technical advances are likely to lead to still more powerful lasers.

When buying an entry-level laser engraver, such as a 5W model, it is advisable to consider if the machine can be upgraded with a more powerful laser module replacement in the future.

What will you be using it for?

Be sure to match your needs with the laser engravers that you are considering. Carefully assess if the laser engraver can process the materials, thicknesses, and sizes of the potential workpieces.

How are files communicated to the laser engraver?

Typically files are sent from a computer via USB, or by WiFi or cloud services. Most laser engravers also have a TF card reader that will accept input on a microSD card.

Are there any essential laser engraver accessories that should be considered?

Yes, there are. The first is a pair of laser-safe goggles, to protect the users' eyes. These are an absolute necessity. The light from the laser can cause blindness or other

serious vision problems. Fortunately, a pair of goggles is almost always provided by the laser engraver manufacturer.



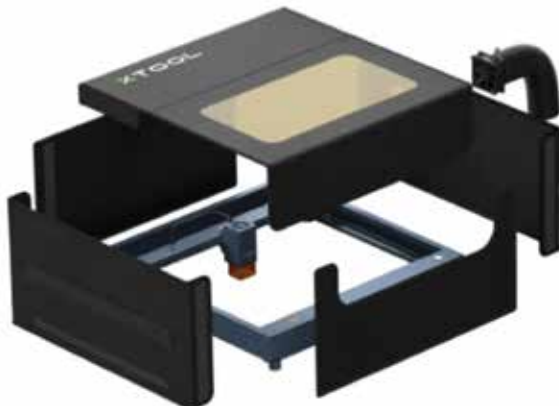
These goggles from xTool provide eye protection from laser light in the wavelength of 180nm-540nm. Credit: xTool

Second, is an Air Assist, an air pump that directs a strong flow of air through a flexible plastic tube to the laser head, in order to clear away smoke, soot, and debris. The air assist produces cleaner workpiece cuts, and helps to keep dirt and pollutants off of the laser lens.



This air pump kit from Ortur can be used with virtually any laser engraver. Credit: Ortur

Third, is an enclosure, which surrounds the laser engraver and keeps airborne particles and odors con-



This enclosure, shown in an exploded-view, completely surrounds the laser engraver while still providing access. Credit: xTool

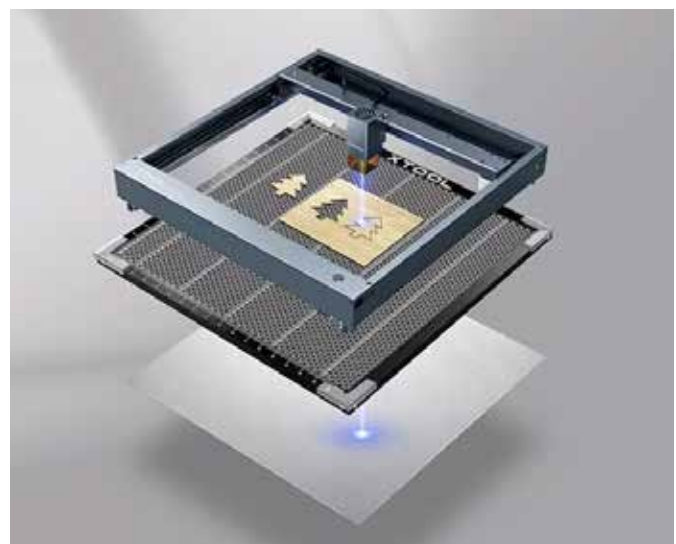
tained. The enclosure also keeps the intense light from the laser contained within the structure.

Fourth, is a rotary attachment which enables engraving on round and cylindrical objects, such as water bottles. A good rotary includes a good selection of accessories to accommodate objects of many shapes and sizes.



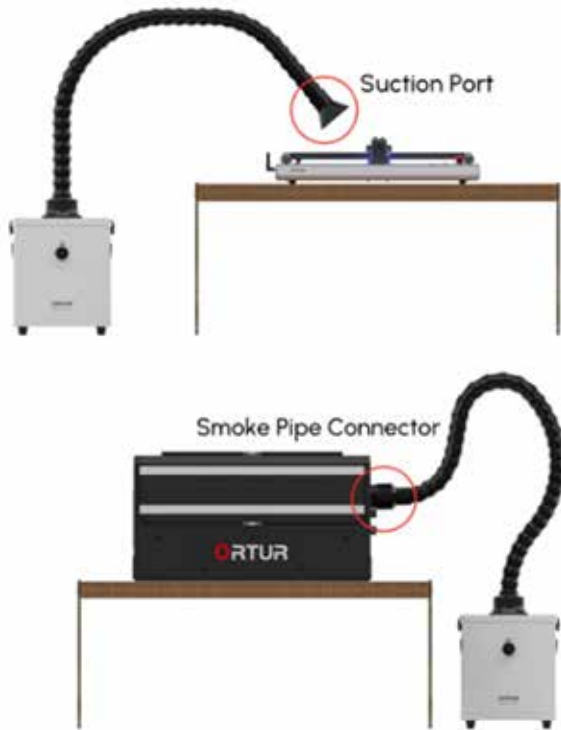
The xTool RA2 Pro rotary can be configured to securely hold almost any object for engraving. Credit: xTool.

Fifth, is a metal base, with a honeycomb or ribbed surface, that protects a work surface from the laser intensity, and serves to allow air under a workpiece, providing cleaner cuts.



The xTool Honeycomb Working Panel Set for the D1 Pro/D1, sits below the laser engraver and above a metal sheet. Credit: xTool

Sixth, is a smoke purifier, a device consisting of a series of filters that remove smoke and other airborne pollutants generated by a laser engraver. The smoke purifier has a flexible hose that can attach to a laser engraver enclosure, or else, less effectively, be suspended over the laser module as it is working.



The Ortur Smoke Purifier 1.0 has the flexibility of connecting directly to the Ortur Enclosure 2.0 (which can accommodate any conventionally-sized laser engraver) or positioning its flexible suction port over the moving laser module. Credit: Ortur

If you are considering a laser engraver you need to give serious attention to your potential workflow. What tools will you need to measure, cut, trim, burnish, drill, and polish your workpieces? You may already have many of these accessories in your shop.

I have released one free chapter from my new book *Focusing on Laser Engraving and Decorating: Affordable, Versatile, and Creative Marking, Engraving and Cutting* (<https://tinyurl.com/2j2kmyc4>). The chapter, "Prep and Finishing Laser-Processed Materials" can be read on- or off-line, and distributed freely. It is available at <https://tinyurl.com/ycxfj3w7>.

Links for the items in the chapter can be viewed at <https://tinyurl.com/3s8sxbkm>. Items purchased through the links may generate a small commission.

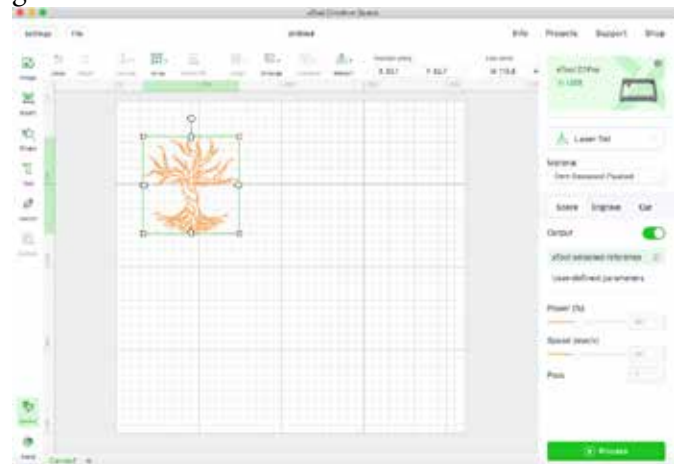
How do you rate the speed of a laser engraver?

First, there is the speed at which the laser module moves across the workpiece. This is the engraving speed, and is measured in either inches per second (ips) or millimeters per second (mps). Second, is the processing speed, which is a measure of the amount of time required to complete a particular job. A critical factor in assessing speed is resolution, which determines the level of detail in the engraving. Resolution is measured in dots per inch (dpi), or pixels per inch (ppi). The higher the resolution, the longer it will take to engrave the workpiece.

How quickly a job can be completed is dependent on the power of the laser, the mechanical system moving it, and the nature of the material being processed.

What software is required?

The quality of the software determines what can be produced, and how easily the process can be performed. Manufacturers may bundle software for a desktop computer and/or a mobile device at no additional cost. There are some free software options, including LaserGRBL (Windows only), and Cuttle (free for casual use). All software options output G-code, an industry standard developed to control CNC (Computer Numerical Control) devices, of which laser engravers are one.



The xTool Creative Space software, available for MacOS and Windows, provides a complete design, editing, laser processing, and machine control solution. Credit: xTool

The recognized software standard for laser engraving and cutting is LightBurn, which provides extensive support for designing, editing, and controlling a wide variety of laser devices. It is available as a free trial version and at a reasonable cost for Mac OS, Windows, and Linux.

Inkscape, is a free open-source vector graphics editor that can be used to both create and edit designs. Certain commercial software, such as Adobe Illustrator, CorelDRAW, provide advanced features that can enable intricate designs.

Where can I find designs to engrave, and shapes to cut?

Some laser engraver manufacturers, such as xTool and Ortur, provide a gallery of projects that can be imported directly into their software. There are also numerous marketplace sources online, such as Etsy and Thingiverse, and others that offer free or lowcost designs, such as Vecteezy and Freepik. Many websites are devoted specifically to laser engraving and cutting, such as Ponoko.com, dxfdownloads.com, and designbundles.net.

What skills are required to own a laser engraver?

Most laser engravers require some degree of assembly, so some very basic mechanical skills are required. Illustrated instructions are generally provided, although the manufacturer and users may have produced helpful instructional YouTube videos showing step-by-step assembly.

Basic computer skills are helpful for communication between the laser engraver and the device running the software. Obviously, the greater the familiarity with the software, the more that can be accomplished, and with the fewest problems.

Each job that is produced will require at least two critical settings: the laser power, and the speed at which the laser head is directed to move. Some manufacturers provide these settings for a list of common materials...others do not, and require the user to determine the settings themselves through material testing, or depend on the laser engraving community to provide them.

Where do you find materials to engrave and/or cut?

Materials, including wood, acrylic, leather, cardboard, paper, and fabric, which can all be engraved and cut; and metal, glass, and stone, which can only be engraved, can be purchased in a variety of places. These include hobby and craft stores, home improvement centers, on-line retailers, and directly from laser engraver manufacturers. Certain materials require a pre-

treatment, such as a special coating, in order to react to the laser. This is the case with all translucent materials.

There are certain materials, such as vinyl, that should never be used, since they emit a toxic gas when exposed to heat. Users must carefully evaluate each material before use.

What maintenance does a laser engraver require?

Like any precision machine, a laser engraver requires routine maintenance. This includes keeping the timing belts properly tensioned, to keep the laser head movement precise; keeping the steel shafts that the wheel bearings run on, lubricated, to reduce friction and prevent rust; and keeping the laser lens clean, by rubbing it with an alcohol-soaked cotton swab.

What can go wrong with a laser engraver?

Laser engravers tend to be reliable machines, however, there is always the chance that something will go wrong, rendering the device temporarily unusable. For example, the parts that move the laser module can malfunction, and either cause the engraving to be out of alignment, or make it fail entirely. The communication between the computer and the laser engraver can breakdown and totally halt production. And, over time, the strength of the laser diode can degrade and will eventually need to be replaced. Proper routine maintenance, and avoiding firing the laser routinely at 100% power, can keep a laser engraving operation up and running.

How safe is a laser engraver?

The heat of a laser engraver presents two potential safety hazards. First, if the laser, due to a malfunction, was to remain on in a fixed position, for a prolonged time, it could start a fire. This is one reason why a laser engraver should never be left unattended. Some laser engravers, fortunately, have built-in safety features to prevent this from happening.

Second, the fumes emitted by a laser engraver, when working with certain materials, can produce either a poisonous gas, or smoke that can be injurious to the health of humans and animals. The user must know which materials, such as vinyl, should never be used.

Children should always be supervised by a responsible adult.

What about the manufacturer warranty and support?

It is important to determine how reliable the manufacturer is, what kind of warranty is provided, and how responsive they are to customer problems and concerns. Potential buyers should read comments from machine owners, and search Facebook for user groups related to the particular device. It can be helpful to determine how long the model has been on the market, and what problems users have identified. Ask if the manufacturer offers an extended warranty; if replacement parts are readily available, and at reasonable cost; and if there is a return policy.

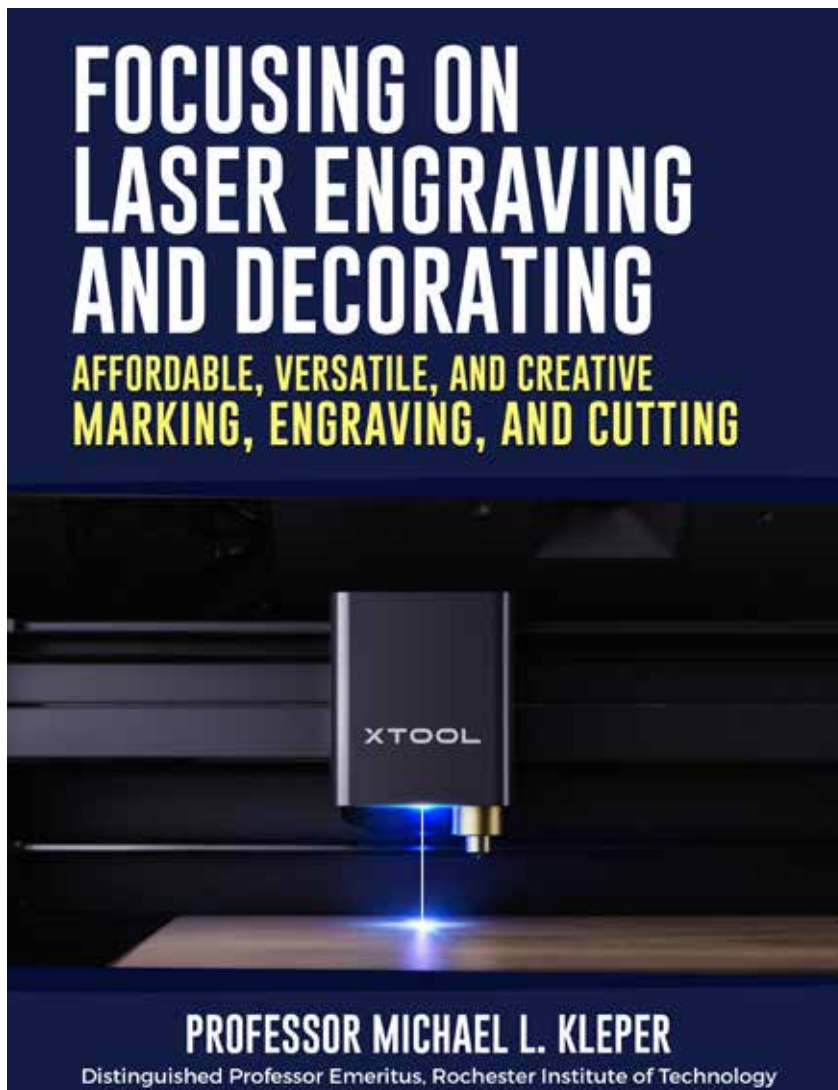
Can you make money with a laser engraver?

The simple answer is “yes.” However, the user must be competent, sufficiently skilled, able to find a market for their prospective merchandise, and determine

how to reach potential customers. Even if a user does not actually make a product, there are opportunities for adding personalization, with names, logos, and custom designs to a wide variety of existing products, such as ball-point pens, luggage tags, giftware, wrist bands, coasters, and hundreds of other items.

How can I learn more about laser engraving?

The laser engraving community is very active, and growing. There are many free YouTube videos with tutorials and demonstrations that are a good starting point for researching machines before buying. Facebook has many user groups that not only provide news and information, but are very responsive to member questions and problems. Some adult education programs offer night classes and workshops, usually with helpful hands-on training. Finally, books, written by independent experts, are very effective tools for focused learning on laser engraving.

**Further Reading**

In-depth coverage of the entire laser engraving and cutting process is available in the new book, **Focusing on Laser Engraving and Decorating: Affordable, Versatile, and Creative Marking, Engraving and Cutting** (<https://tinyclips.com/2j2k-myc4>) sold exclusively on Amazon.com.

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