

# xTool D1 Pro 20W

The xTool D1 Pro 20W (FIG. 1) represents a dramatic improvement in the elements that define a state-of-the-art diode laser engraver/cutter. Having sold more than 50,000 xTool D1 units, this next generation machine incorporates both the features that were lacking in the previous model, and critical improvements that make it the new standard for the category. xTool has the distinction of being an industry leader in machine design and attention to user feedback.

The D1 Pro series is available with either a 5W, 10W, or 20W laser module. The 20W module is the most powerful laser on the market, and provides record-breaking machine specifications that rival those of a CO2 laser!

xTool is the first to use color to distinguish their machines. Users have the option of selecting from the standard metal gray or the new golden red. While the color of the machine has no effect on its performance, the red frame serves to make an aesthetic statement that laser engraving fits in a studio as well as in a workshop.



FIG. 1. The xTool D1 Pro with a 20W laser module is the most powerful diode laser device of its kind. Courtesy: xTool

## Construction

The xTool D1 Pro, as well as its predecessor, the xTool D1, provides one of the only complete laser engraving/cutting workflow component packages. xTool sells the laser engraver, the honeycomb working panel, the enclosure, additional risers, the air assist set, and the extension kit. In addition, it is the first to offer a spare parts kit, as well as an Extra Care warranty option. The only missing item is a camera, which users may find unnecessary, and is not supported by the native software.

The 20W laser is composed of four 5W lasers precision-aligned to produce a laser spot size of 0.08mm x 0.10mm. The concentrated laser beam is capable of cutting 10mm basswood, or 8mm black acrylic in a single pass, with an engraving/cutting accuracy to within 0.004”.

xTool rates the laser as “the most powerful diode laser module in the world.” It has the potential to increase working rates two-fold or more, with an engraving speed of up to 10,000mm/min. All of this power equates to using significantly more robust materials that can produce stronger and more durable products, such as furniture.

All of the structural components are made of sturdy materials, precision manufactured to withstand the rigors of daily use (FIG. 2). The unit includes a full one-year warranty.



FIG. 2. The locking mechanism on the left side of the laser module secures the position of the unit on the z-axis. The lever is an improvement over the original design first shipped with the D1.

### Assembly

There is a certain degree of elegance and sophistication that users encounter when opening the xTool D1 Pro box (FIG. 3). This experience is typical of the high degree of excellence that xTool instills in its products, and strives to provide in its user experience. Users are immediately presented with two slender packages. The first is a variety pack of materials that can be used to become familiar with the engraving and cutting capabilities of the machine. xTool provides more than 100 laserable materials in their on-line store, and herein offers a set of samples. The second is a set of publications, one for assembly, one for operation, and one showing examples of what the laser device is capable of producing (“Magical Things Made by xTool”). The manuals are attractively designed and printed, with clearly illustrated step-by-step instructions (FIG. 4).



FIG. 3. The first things that the user sees when opening the box are a thank you card (already removed), along with a material pack and the documentation necessary for assembly and operation.



FIG. 4. In an age when it is easier and far cheaper to provide manuals as PDFs, xTool has provided beautifully printed collateral materials.

Removing the first layer of rigid foam packing reveals the parts that will ultimately fit together easily and with precision. The fit and finish of the metal frame and other structural materials is impressive, and reflects meticulous engineering and attention to detail. The assembly process is clearly illustrated, and can be completed, in most circumstances, in well under an hour.

Certain design and engineering details make the assembly process easier:

- A nicely designed toolkit is provided along with color-coded screws (FIG. 5). In addition to visually showing the screws in the manual, the use of color paint further simplifies identification, and the application of the paint helps to secure the screws in place. The screwdriver comes with a machined shaft that has an Allen wrench tip on one end and a Philips head on the other. These small details make the assembly process faster and easier.



FIG. 5. Rather than provide screws loosely mixed in plastic bags, xTool provides all of the fasteners and tools in a convenient toolkit that can remain readily accessible.

- The timing belts have been pre-installed, and are enclosed in their frame components to shield them from smoke, dirt, and air-borne contaminants. Over time the belts will stretch and will require tightening to ensure that the stepper motors move the laser module smoothly, quietly, and accurately. A set-screw mechanism at the ends of each belt makes the adjustment process simple and easy. Care should be taken to ensure that the belts are not over-tightened, which can cause distortions of the engraved or cut workpieces.

- The Quick Start Guide, in full-color, is highly visual, with each machine part clearly labeled (FIG. 6). The assembly process is clearly illustrated, with a minimum of text, and enlarged images of assembly areas of particular importance.

- Each part fits precisely, is easily identified, and quickly secured in place.

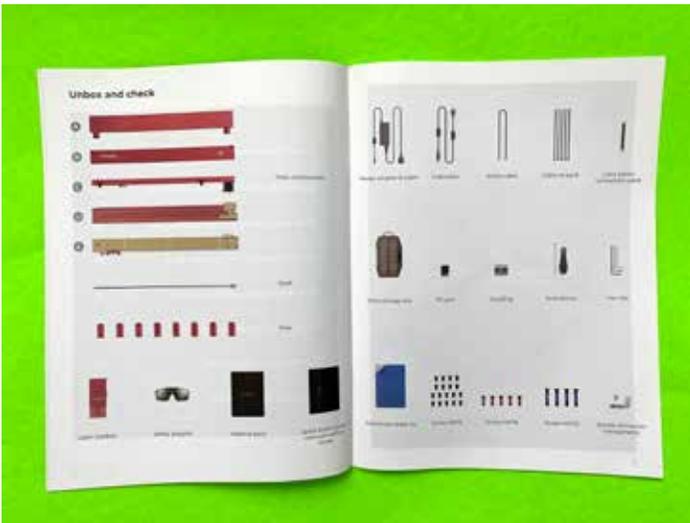


FIG. 6 parts list. All of the parts are clearly displayed and identified.

### Focus

Focusing is accomplished using the focus lever that has been shown to accurately and quickly set the focal distance between the laser module and the workpiece. The focus lever is built-into the right side of the laser module, and held in place magnetically. It is activated by swinging it out and letting it drop so that its tip protrudes downward. The laser module is moved along its z-axis until the tip of the lever touches the workpiece, and is then locked in position. The laser is now set to engrave in focus.

If the laser will be used for cutting, the focus should be set to fall at the base of the workpiece. The reticle engraved in the right side of the laser module is set to correspond to the thickness of the workpiece (FIG. 7). The scale setting 3 relates to a workpiece thickness of 6mm, the setting 4 is equal to 8mm, and the setting of 5 conforms to a thickness of 10mm. According to the xTool D1 Pro 20W manual: "To cut thicker materials, you can adjust the position of the rear plate on the laser module, based on the scale with which the focal length setting bar is aligned, to ensure better cutting performance."



FIG. 7. The release lever on the right side of the laser module is used to set the position of the laser height (z-axis) for cutting, using the increments inscribed in white on the upper edge.

### Laser Module Placement

The laser module, in addition to the laser itself, contains a low-power, yet highly-visible red light crosshairs, that is used to set the starting point for the laser operation (FIG. 8). The crosshairs are offset exactly 16mm from the actual laser point. The crosshairs are used not only to indicate the starting position, but also to visually frame the actual work area, so that the user can confirm the boundary, or frame, in which the laser activity will be confined. When the laser is fired it moves 16mm to the left to compensate for the framing displacement.

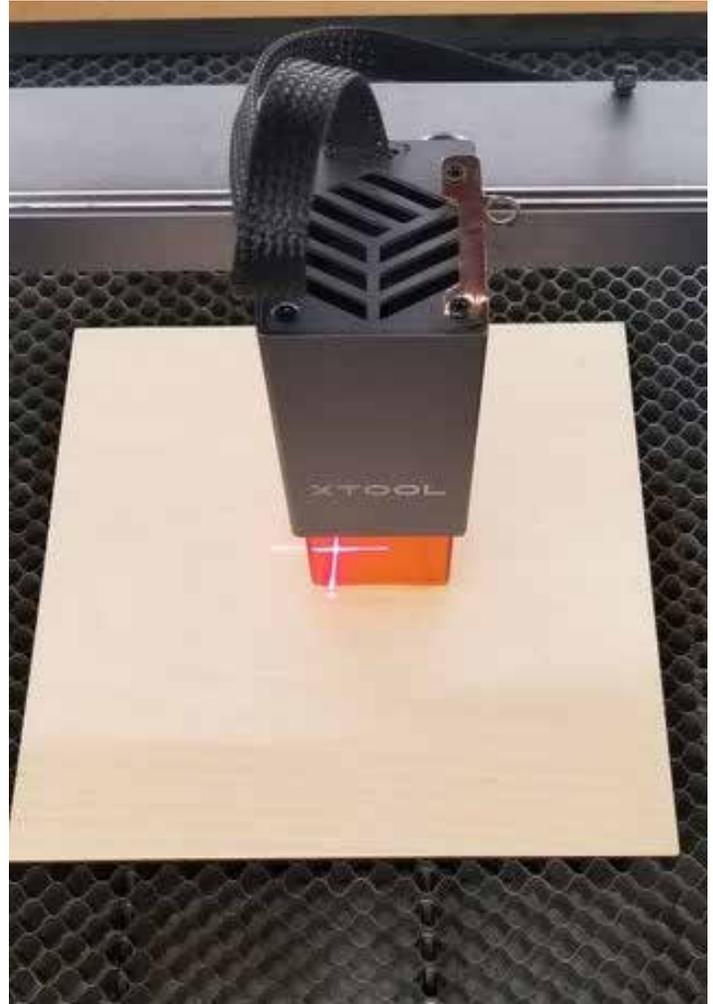


FIG. 8 crosshair-fitting-material\_480x480. The red crosshairs simplify the placement of the laser head with brightly illuminated reference lines.

The D1 Pro incorporates new safety features that detect flames and smoke, and sense frame tilt using the built-in gyroscope. Any deviation from the normal operation of the machine will instantly turn off the laser and sound an alarm. The need for safe operation and vigilant observation cannot be stated strongly enough since fire is an ever-present danger.

Users also need to be aware of the potential dangers associated with processing certain materials, such as those containing PVC (Polyvinyl Chloride) and vinyl. If such materials are exposed to a laser they can release toxic chlorine gas, which is very harmful to humans, and corrosive to machine parts and the laser itself. The use of such materials voids the machine warranty.

Included with the laser engraver is a pair of laser safety goggles, which

are essential to protect the user's eyes as they monitor the progress of the laser beam (FIG. 9). The wrap-around goggles, which are provided with a sturdy zippered carry case, and a cleaning cloth, can be worn directly, or can fit over prescription eyeglasses. xTool sells additional goggles which will be necessary if the user has visitors in the area when the laser is engaged.

### Connections

The D1 Pro supports the full set of connection options: USB, WiFi, and TF card. Using WiFi and the digital storage card the user need not be tethered to a desktop host computer, providing the option to move the engraver to a remote site, or to a workpiece that is immovable, such as a large table or bench.

### Software

The D1 Pro supports several file formats, including NC, BMP, JPG, PNG, DXF and others, meaning that it can process designs from a broad range of sources.

Included with the engraver is the free XCS (xTool Creative Space) software, which provides a range of easy-to-use functions for processing files created in design applications, as well as creating original constructs (FIG. 10). The software is particularly good at helping new users achieve success quickly. Using the USB connection it finds



FIG. 9. Goggles must be worn at all times that the laser is in use.

the connected D1 Pro easily, and determines if a firmware update is necessary. If it is, the user sets the download switch on the D1 Pro motherboard and clicks the download button. In seconds the new firmware is installed, a process that we have found to be much more challenging on competing laser engravers.

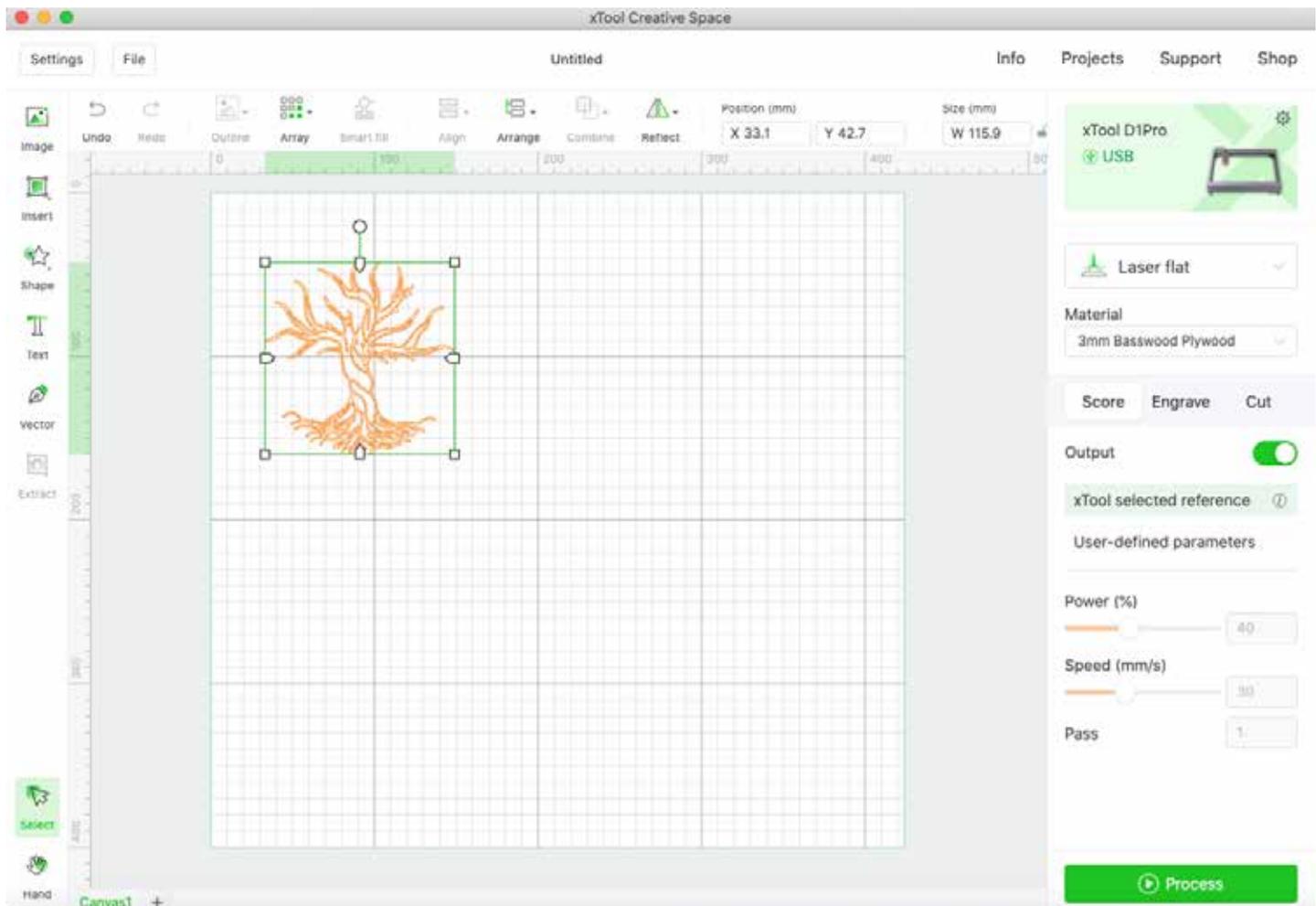


FIG. 10. The XCS user interface has been designed for ease-of-use, with features that help the user get correct and consistent results.

Settings for power and speed, the critical numbers that often vex users, are set automatically if the user chooses to use materials that have been tested by xTool engineers, such as 3mm Basswood Plywood, as shown under the Material field in FIG. 10. The user can easily choose to Score, Engrave, or Cut whatever is on the workspace, and the associated machine settings will change accordingly. This is a significant advantage over competing machines.

The optional LightBurn software (<https://lightburnsoftware.com/>), available for a free 30-day trial, or at a cost of \$60 for permanent use, provides extensive capabilities, and enables the D1 Pro to realize all of its potential. LightBurn, available for Mac, PC and Linux, also supports many more file formats than XCS.

### Laser Positioning

The D1 Pro now includes limit switches that contain the movement of the laser module within the frame (FIG. 11). This not only stops the module from hitting the frame rails, but provides more user control over workpiece placement. Should the laser head reach one of the frame boundaries it will stop and the limit switch will signal an alarm. In addition, and perhaps most importantly, the limit switches enable the use of absolute coordinates, and setting the home position, wherein the user can use a laser bed grid system to accurately line-up workpieces.

The engraving area is 430mm x 390mm (17" x 15.4"), slightly smaller than that of the original D1 due to the increased size of the 20W laser module.



FIG. 11. xTool uses an advanced design, long-lasting electronic limit switch, which is superior to a mechanical roller lever arm.

### Air Assist

The laser head is now manufactured to be “air assist ready” (FIG. 12). In recognition of the fact that air assist is an essential feature for laser cutting, providing cleaner finished material surfaces, and not just an optional add-on, the laser head has been engineered with a built-in nozzle adaptable to a provided air intake connector. The user need only connect plastic air feed tubing and a pump. xTool sells an optional Air Assist Set that provides all of the parts necessary for installation, although third-party solutions can also be used. The xTool air pump is distinguished by its quiet operation, which is a significant advantage, considering potentially long processing times.



FIG. 12. The supplied air intake connector screws directly into a threaded opening in the laser nozzle.

Air assist not only provides a cleaner cut, but enables deeper and faster cutting. Another advantage of air assist is to protect the surface of the laser lens and the light shield, blowing away smoke and air-borne debris. A cleaner lens performs more efficiently and extends the life of the laser head, and a cleaner light shield makes it easier to see the laser activity.

### Rotary

The optional RA2 Pro Rotary Attachment, considered the most versatile rotary device of its kind, enables engraving on a wide variety of cylindrical and round objects of various circumferences and lengths (FIG. 13). The unique design provides unprecedented flexibility in grasping and holding objects, with friction or clamp-style jaws, for precision engraving.

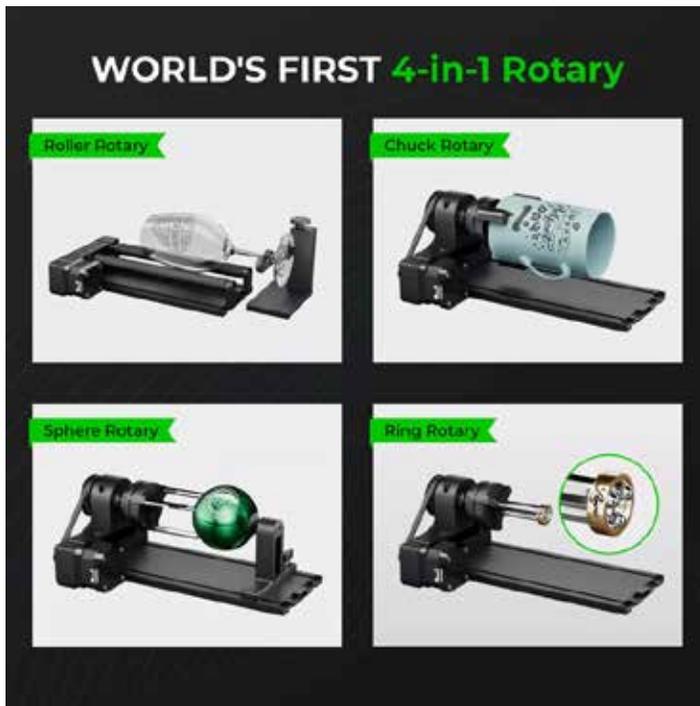


FIG. 13. The xTool RA2 Pro Rotary Attachment provides unsurpassed precision in holding and turning objects in precise synchronization with the movement of the D1 Pro laser module. Courtesy: xTool

Included with the D1 Pro are a set of eight threaded risers, each 45mm, that can be used to adjust the distance between the laser head and the workpiece. The risers work to accommodate thick workpieces as well as objects (drinking glasses, mugs, etc.) held on the rotary device.

#### xTool Enclosure

xTool makes the most reasonably-priced engraver enclosure on the market, complete with exhaust fan and light-shielding viewing window (FIG. 14). The unit, which is foldable for easy storage, is composed of light-weight fire-retardant materials which provide protection from smoke, air-borne contaminants, and noise. The unit components fit together with hook-and-loop connectors, making assembly and break-down quick and easy.

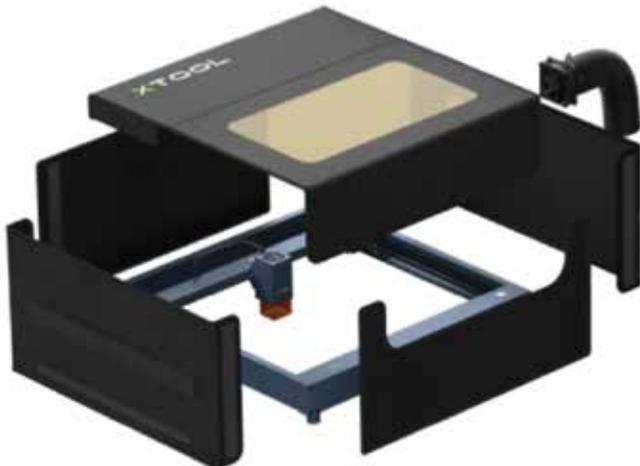


FIG. 14. The xTool enclosure completely surrounds the footprint of the D1 Pro, confining the intensity of the laser light, as well as smoke, and airborne contaminants. Courtesy: xTool

#### Maintenance

Relatively little maintenance is required, and consists of regularly applying the supplied grease to the slide bars every two weeks to two months, depending on usage. The user should ensure that the optical shaft is clean of dirt before applying a thin, uniform layer of grease. xTool uses high-quality components, and the steel rollers, bearings, and shafts are rated as lasting three times longer than competitors.

Regular cleaning of the laser lens and surrounding light shield should be performed when a visual inspection warrants it. xTool provides clear instructions at <https://tinyurl.com/yu8jv3ud>.

#### 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://tinyurl.com/2j2kmyc4>) sold exclusively on Amazon.com.

