**Epilog Mini 50 Watt laser-cutter**

## EPILOG MINI 24 (40WATTS)

The Laser-cutter is a Epilog Mini.
Let's be clear it won't cut through metal. But it is excellent at wood and acrylic. It cuts and engraves any 2D drawing you like. I can even melt sugar to make objects if you want. It will also help you to make press-fit kits. You could cut paper, cardboard, fabric, leather, and many other materials. Have a look at the list below to make sure your design is possible and safe with our EPILOG.

## TECHNICAL SPECIFICATIONS ?

**Software:** Adobe, Paint.net, Corel Draw or just about anything that will create a drawing or jpg
**Platform Size:** 300 mm x 600 mm / 12 in x 24 in.
**Accepted File formats:** .svg, .pdf (and more).

## HOW TO START ?

**Step 1**
Turn on the machine. (Epilog mini24) - On the left side of the laser cutter, switch the power on.


– **Turn on fume evacuator**. It’s next to the washer and dryer in the front of room 3004. The power switch is above the sink and looks like a light switch.

**Step 2**

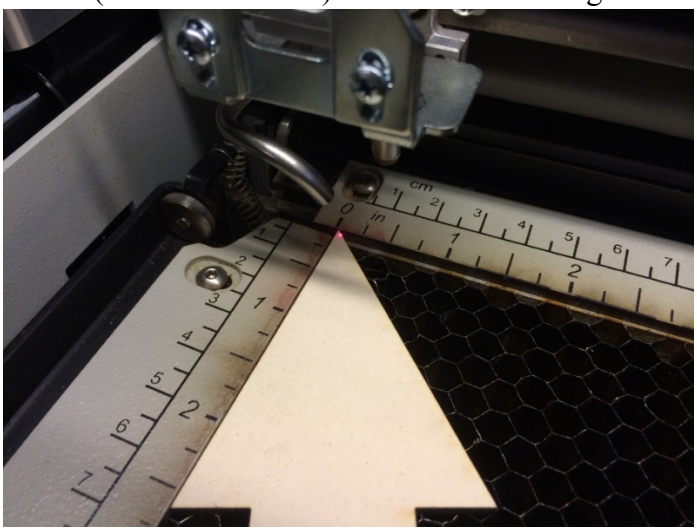
Press the [X/Y OFF] button followed by the green [GO] button.

**Step 3**

Place material in the machine.
You can use the arrow buttons [up] and [down] to lower the bed, if necessary.

**Step 4**

Press the [POINTER] button to see the lasers position.
Proceed to move the laser (by hand) to where you want to start. Bear in mind, that by default, the machine starts at the top left corner of your design file. Generally we set the origin at the high-left corner (which is the zero) to take full advantage of the material/sheet.



**Step 5**

If you are satisfied with the position you can press [SET HOME] and then [RESET].

**Step 6**
Setup your print file.
Open the Document in Adobe PDF reader on the computer. Press the [CTRL]+[P] on the keyboard to print.

**Step 7**
In the printer dialogue, select the right printer name, set the scaling to 'actual size' and keep the rotation on 'portrait'.

**Step 8**
Click on the [PROPERTIES] tab to set the laser cutter's options.


Here you will need to determine the settings that correspond with the material you have placed in the laser cutter.

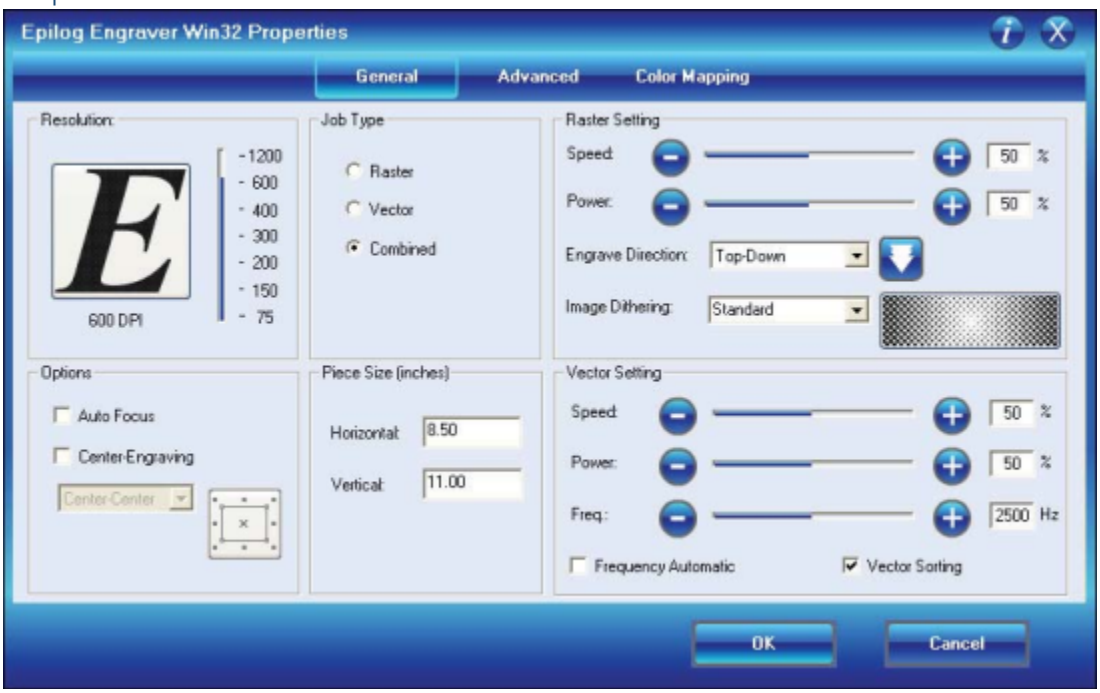
**Step 9**
When ready click on ok of the properties menu and print menu. The job will be waiting in the laser cutter display.

**Step 10**


Switch on the air pressurizer. And then hit the green [GO] button on the machine.

When running the job, DD NOT leave them machine unsupervised.
When display say's 'done", please wait 10 - 30 seconds before opening machine (ventilation time).

## Properties menu




- Resolution: will influence job time greatly when rastering. (Recommend default 400 DPI).
- Job Type: to define the job style.
- Raster settings: to define heat settings of engraving job.
- Vector settings: to define heat settings of cutting job.
- Piece size: enter size of your piece of material (max 600 x 300 mm).
- Options: define custom starting point (center engraving) and automatic focusing of lens laser (auto-focus).

Look in the Epilog manual for recommended settings, when adjusting the speed, power and freq options.

To prevent the autofocus pin from getting trapped, do NOT use with with the honeycomb bed. There is a metal clip available to set the focus point by hand.

Color Mapping


Color mapping is used to define multiple settings within 1 design file. The speed, power and frequency work in the same as in the general options.

To remove a color just mark it and hit the [–] button. To Add a color you hit the [+] button. You can also move the color up and down the list using the arrows. The color that is at the top is the one that is going to get cut first.

### Good to know

The laser cutter cuts by burning away a little bit of the material. The laser follows the center of your vector line (drawing) and will burn away 0.1 mm of material on each side of the vector. Beware! Different materials and different heat settings can influence how much material exactly is lost. It is recommended to first test joinery designs before cutting the whole sheet.


**The burning away 0.2 mm of material is a guideline, not a golden rule.**

## Safety

**NEVER** leave the Laser running unattended.

**DO NOT** operate the Laser with the machine's focus clip in place. If the unfocused beam strikes a reflective surface, it could be directed out of the cabinet.

**ALWAYS** use air assist when vector cutting.

**KEEP** the area around the machine free of clutter.

**KEEP** you Regularly remove the vector grid to clean any small pieces that have fallen through the grid.

**ALWAYS** keep a properly maintained and inspected fire extinguisher on hand. Epilog recommends a Haltron fire extinguisher. Since it discharges a clean, easily removable substance that is not harmful to the mechanics or the wiring of the laser system.

**DO NOT** open any of the machine's access panels while the unit is plugged in.

(NON-EXHAUSTIVE) CHEAT-SHEET TO RASTER-ENGRAVE OR CUT MATERI Materials you can: engrave: cut:

| | | |
|---|---|---|
| 1 - Wood (MDF, plywood, etc) | yes | yes |
| 2 - Acrylic | yes | yes |
| 3 - Fabric | yes | yes |
| 4 - Glass | yes | no |
| 5 - Coated Metals | yes | no |
| 6 - Ceramic | yes | no |
| 7 - Delrin | yes | yes |
| 8 - Cloth | yes | yes |
| 9 - Leather | yes | yes |
| 10 - Marble | yes | no |
| 11 - Matte board | yes | yes |
| 12 - Melamine | yes | yes |
| 13 - Paper | yes | yes |
| 14 - Mylar | yes | yes |
| 15 - Pressboard | yes | yes |
| 16 - Rubber | yes | yes |
| 17 - Wood veneer | yes | yes |
| 18 - Fiberglass | yes | yes |
| 19 - Painted Metals | yes | no |
| 20 - Tile | yes | no |
| 21 - Plastic | yes | yes |
| 22 - Cork | yes | yes |
| 23 - Corian | yes | yes |
| 24 - Anodized Aluminum | yes | no |

**think[box]**
**Laser Cutter (Epilog Helix 24)**
**Speed & Power Settings**

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| | 300 DPI Raster Engraving | 400 DPI Raster Engraving | 600 DPI Raster Engraving | Vector Cutting |
|---|---|---|---|---|
| | Speed/Power | Speed/Power | Speed/Power | Speed/Power/Frequency |
| ABS | | | | 1/8"-20/60/5000 |
| Acrylic | 100/50 | 100/40 | 100/30 | 1/8" (3 mm) – 20/100/5000<br>1/4" (6.4mm) – 7/100/5000<br>3/8" (9.5 mm) = 6/100/5000 (two passes) |
| AlumaMark | 100/30 | 100/25 | 100/20 | N/A |
| Anodized Aluminum | 100/55 | 100/45 | 100/35 | N/A |
| Balsa | | | | 1/16"-50/10/2500<br>1/4"-40/45/2500 |
| Painted Brass | 100/30 | 100/25 | 100/20 | N/A |
| Corian/Avonite | 25/100 | 35/100 | 45/100 | 1/8" (3 mm) - 50/80/5000 |
| Delrin Seals | 100/40 | 100/30 | 100/20 | 1/8" (3 mm) – 60/90/500 |
| Glass | 40/100 | 50/100 | 60/100 | N/A |
| LaserMax | 100/45 | 100/35 | 100/30 | 27/40/5000 |
| Leather | 100/40 | 100/30 | 100/20 | 1/8" (3 mm) - 60/90/500 |
| Marble | 100/100 | 100/90 | 100/80 | N/A |
| Mylar (5 mil) | 100/65 | 100/55 | 100/45 | 100/7/500 USING 2 Passes |
| Mat board | 100/65 | 100/55 | 100/45 | 34/40/500 |
| Melamine | 100/60 | 100/70 | 100/80 | N/A |
| Rubber/Stamps | 20/100 | 30/100 | 40/100 | 25/100/100 |
| Wood<br>(See Also Balsa) | 60/100 | 80/100 | 100/100 | 1/64"-60/25/500<br>1/32"-50/35/500<br>1/16"-40/50/500<br>1/8" (3 mm) – 30/60/500<br>1/4" (6.4mm) – 7/60/500<br>3/8" (9.5 mm) = 10/100/500 (two passes) |

*Rows marked as blue are stocked materials

**DANGER:** If your material is not listed, find the MSDS sheet and show it to the lab manager.
Some materials release toxic fumes when laser cut.

Revision Date: 4/18/13

# Design considerations for laser cutting Masonite

All tests where done on a 40 watt machine using Masonite purchased from Lowe's. It's nominally 3/16" but is undersized considerably and varies quite a bit in thickness throughout the same sheet. It has a sticker on it that says "Tempered Service". This essentially means both sides are smooth.

**Kerf**

The laser cuts on the line you specify. However, it does have a thickness. I've measured this and on average it is 0.006" wide (0.003" on either side of the line).

**For engraving**

| Speed | Pow | Frequenc | Remarks |
|---|---|---|---|
| 100 | 5 | 500 | Very light/surface is breached but not |
| **100** | **25** | **500** | **Clearly legible/good for general use** |
| 75 | 50 | 500 | Very dark |

**For cutting**

The following was done on a piece that measured 0.1400" thick…

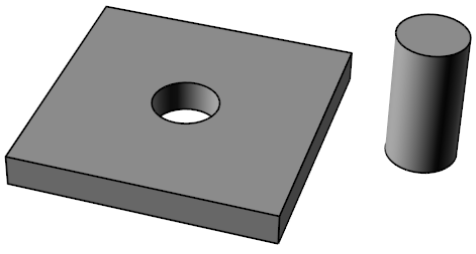
| Speed | Pow | Frequenc | Remarks |
|---|---|---|---|
| 100-30 | 100 | 500 | Backside of the board is not breached |
| 20 | 100 | 500 | Start to see an outline on the backside |
| 12 | 100 | 500 | May cut all the way through |
| 8 | 100 | 500 | Guaranteed cut |

**For pin registration**

<u>Using ¼" precision ground steel pins</u>

The pins are exactly 0.25" in diameter.

For a tight fit: make the holes 0.2425"
For a loose fit for rotating: make the holes 0.265"



<u>Using ¼" cold rolled steel</u>

The stock measures 0.2445” in diameter.

For a tight fit: make the holes 0.2420”
For a loose fit for rotating: make the holes 0.2445”

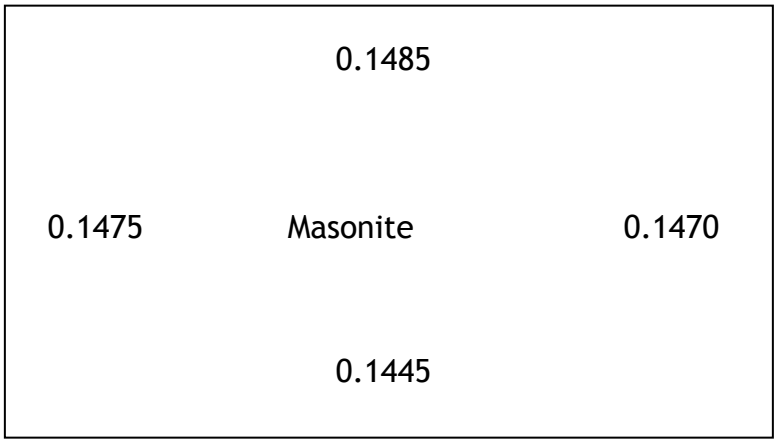
**For ribbing**

The thickness of Masonite varies quite a bit. I have sampled the 3/16” Masonite and it varies greatly between 0.1235” and 0.1535”. This poses an issue when ribbing, as ribbing assumes a constant thickness in material.

We need to account for variations in material thickness, and then use an offset value from the measured thickness to determine what our notch thickness will be. The following shows how this is accounted for…

Start by measuring the thickness of the material on all 4 sides with calipers. To take an average, add all thicknesses, and divide the result by the total number of samples.

I.e.

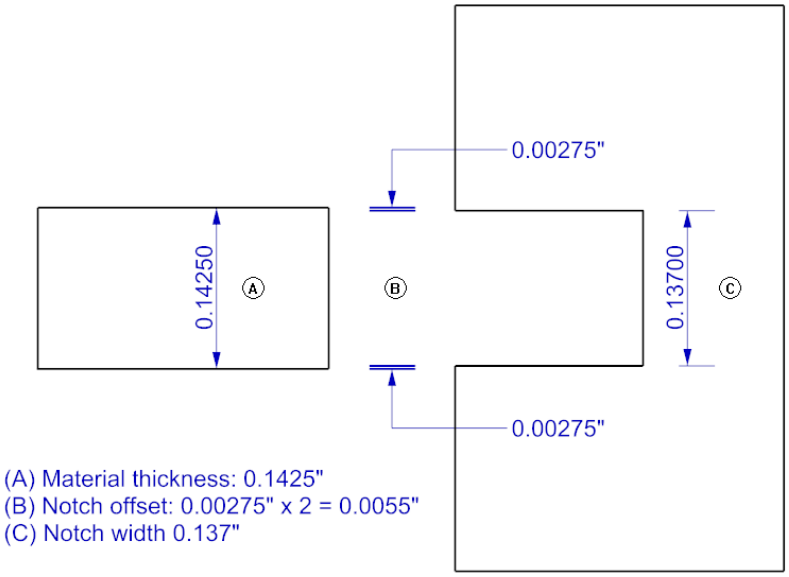



**Average**

0.1485”
+ 0.1475”
+ 0.1470”
+ 0.1445”
0.5875”

0.5875”/4 =

Use this average thickness for our calculations. Our notch thickness is calculated as an offset from the material thickness (what we calculated as an average in the example above). The notch offset is actually undersized from the material thickness, due to the kerf of the laser. In the image below, the notch is 0.00275” smaller than the material on each side (a total offset of 0.0055”). The offset you decide on depends on how tight you want things to fit. Refer to the chart on the next page for a range of values to use…




To figure out our final notch thickness, start with your average material thickness, and then subtract the notch offset you want to use to get your final notch width. I.e.

| Average Material Thickness 0.1425” | - | Notch Under Size 0.0055” | = | Notch Width 0.1370” |
|---|---|---|---|---|

All tests done at 100% power, 8% speed, 500 frequency

| Average material | | Notch offset … | | Notch width | Remarks |
|---|---|---|---|---|---|
| 0.146 | - | 0.0064” | = | 0.1405” | Tight but doable (Ok if |
| 0.146 | - | 0.0065” | = | 0.1404” | Tight but doable (Ok if |
| 0.146 | - | 0.0063” | = | 0.1403” | Tight but doable (Ok if |
| 0.146 | - | 0.0064” | = | 0.1402” | Tight but doable (Ok if |
| 0.143 | - | 0.0061” | = | 0.1370” | Pretty good |
| 0.143 | - | 0.0059” | = | 0.1372” | Better |
| 0.142 | - | 0.0057” | = | 0.1368” | Better |
| 0.142 | - | 0.0055” | = | 0.1370” | Even better |
| 0.128 | - | **0.0053** | = | 0.1235” | **Perfect (not too loose or** |
| 0.128 | - | 0.0050 | = | 0.1238” | Very easy to slide/almost |
| | | Smaller values = a looser | | | |

In most cases, you will need more than one sheet to complete all the ribs for an object. In these cases, try to use material that is as similar in thickness as possible, and use an average of the thickness for all sheets when determining your average material thickness.

Also, assuming you don't know the average thickness of the material you will be using when designing your ribbed object, you can simply rescale all your ribbed silhouettes in Rhino to their final size just prior to laser cutting.

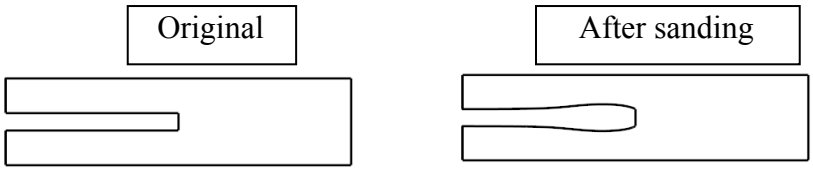
When fitting things together

Keep in mind that as you slide the ribs together, things will get tighter as you reach final position. If they start off tight, you they will only get tighter and you may get stuck half way in! If things are tight, avoid committing sliding the pieces in all at once. Work the pieces in and out of their notches a few times first to help remove any remaining charred edges. If you are pretty close to a good fit, you may also want to try chasing the notches with some scrap Masonite first before assembling the pieces. If things are still too tight, resort to sanding.

If sanding is required

Use 200-mesh sandpaper and something rigid, flat and thin to give it support. Simply removing the charred surfaces should be enough to get a good fit.

Although the rib may start off sliding well, it can get tighter as more and more of it is slid into place. For this reason, consider sanding more aggressively on the interior part of the slat as shown below on the right…




As far as chronology, start with a few middle ribs in one direction, and then add a few middle ribs in the opposite direction. Then add from the center outwards. This will minimize tightness…