



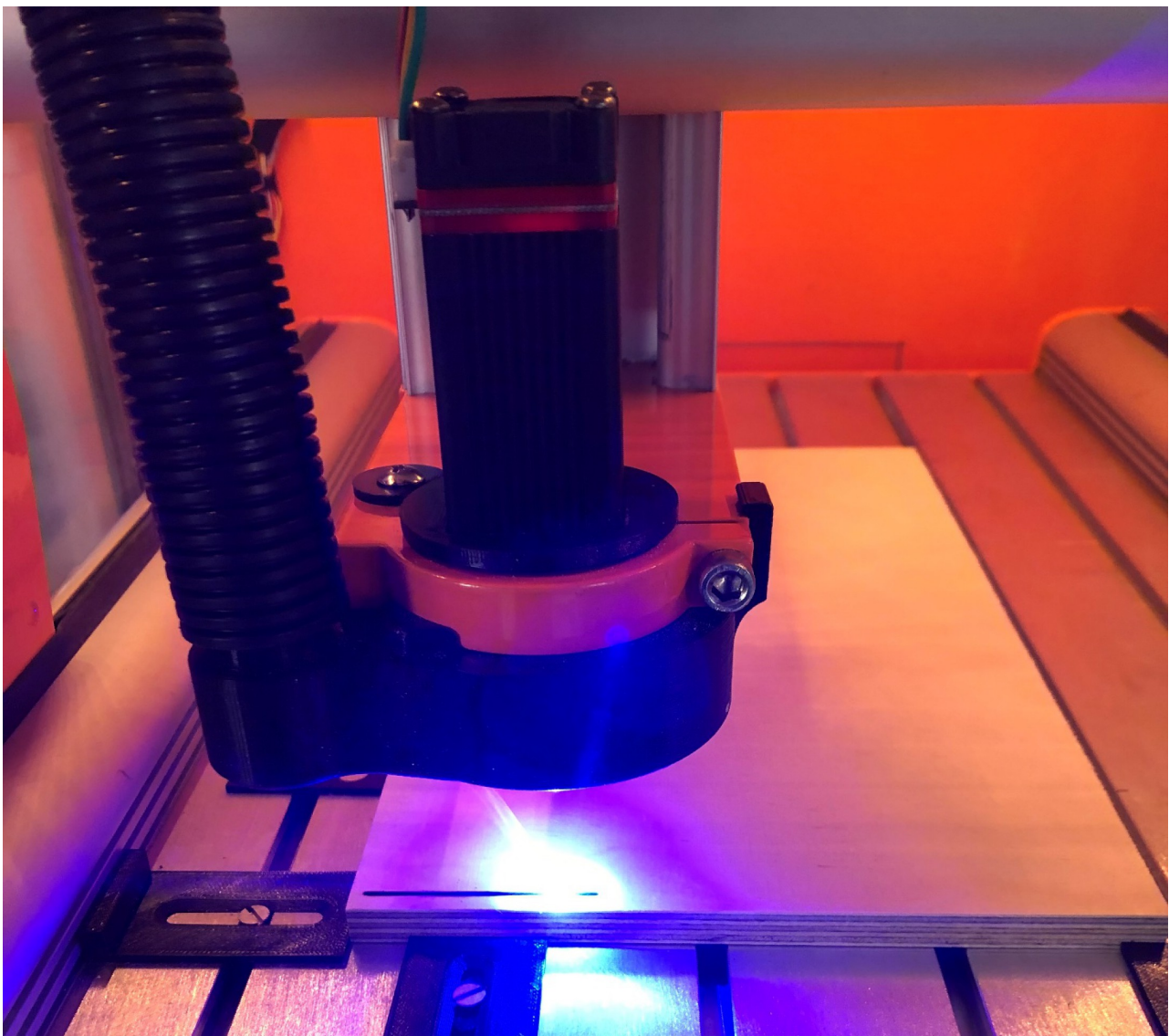
How to...

Make your first Laser project.

How to get started working with your laser, engraving and cutting.

In this **How to** I explain how to use *WinPC-NC* and a 3rd party laser on your Stepcraft CNC-machine.

The hardware setup used in this tutorial is a Stepcraft CNC machine in combination with a NeJe 20Watt laser, but should work on most CNC machines and (PWM controlled) lasers and *WinPC-NC USB*.



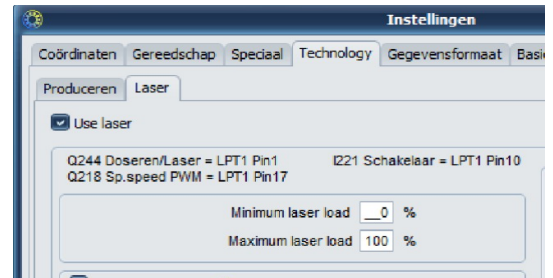


WinPC-NC settings

Connect CNC machine to PC and start *WinPC-NC*.

We first check if the essential settings are correct for use with the Laser.

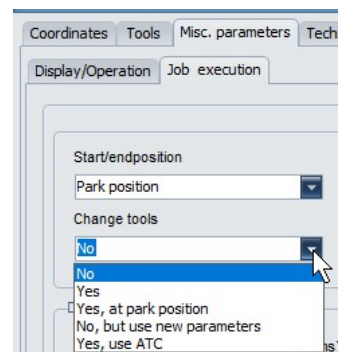
- Open > Parameters > Technology > Tab Laser >
 - o Check if **“Use Laser”** selected
 - o check if **Q244** is connected with **LPT1 Pin 1**
 - o check if **Q218** is connected with **LPT1 Pin 17**



If outputs are not configured goto signal wizzard and assign the pins to output signals.

Because we use a laser there is no need for a **“Toolchange”** so let’s change that and prevent a burning dot/line from change position to startposition>

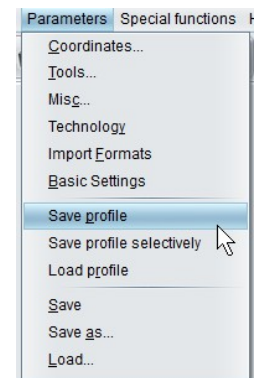
- Open > Parameters > Misc.... > Job execution >
 - o Change tool to **No**



Because we use the machine for more than only one task we save this in a machine profile.

- Open > Parameters > Save profile
 - o Enter a name like **Laser setup** and save file

If we want to use the laser after a normal milling job, we just load the **“Laser setup”** and have all the correct machine settings for this usage.



Hint. You can set an option in the program that will ask at opening of *WinPC-NC* which setup to use.

- Open > Parameters > Basic settings > Display/Operation
 - o place checkmark at **“Profile Management upon startup”**

WARNING ! Before activating the laser take note of the safety goggles supplied, you can ruin your eyes!!!

Note: If this is the first time you are using the laser it's strongly recommended that you execute the **“Laser Greyscale Test”** and **“Laser Cut Test”** which are found In > Special functions. Remember the results are only applied on the used material during the tests.

Prepare first run ...

The NEJE laser is provided with a little print on this print we see 4 buttons;

- PWM – (minus)
- PWM + (plus)
- Temp
- Switch (3 functions) → OFF
 - Manual (default 1% power)
 - PWM (control by G-code)



Figure 1 Test / Control print NEJE

You can toggle the 3 functions by pressing Switch.

- when power up it is default OFF;
- next press switch to manual, (default value is 1 % power by pressing/holding PWM – you can go as low as 0.01 %);
- next press switch to PWM/TTL control by G-code. (only if used and connect on the two pins on top print)

The minimum power can be adjust (in manual mode) to 0.01% this is perfect for XY zero point adjustment, and the intensity is so low that wearing safety goggles is not paramount by still be advised.



Figure 3 Vacuum, Air and magnet attached cone

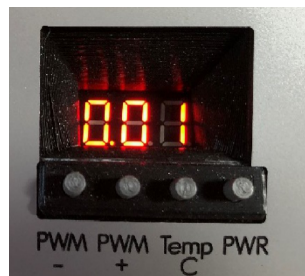


Figure 4 Power display 0.01%

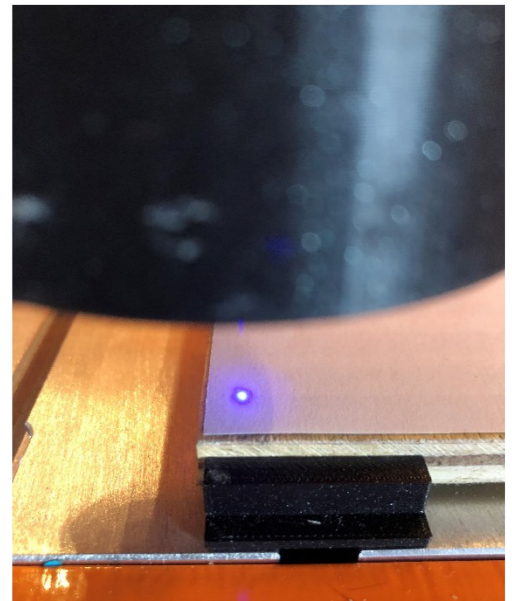


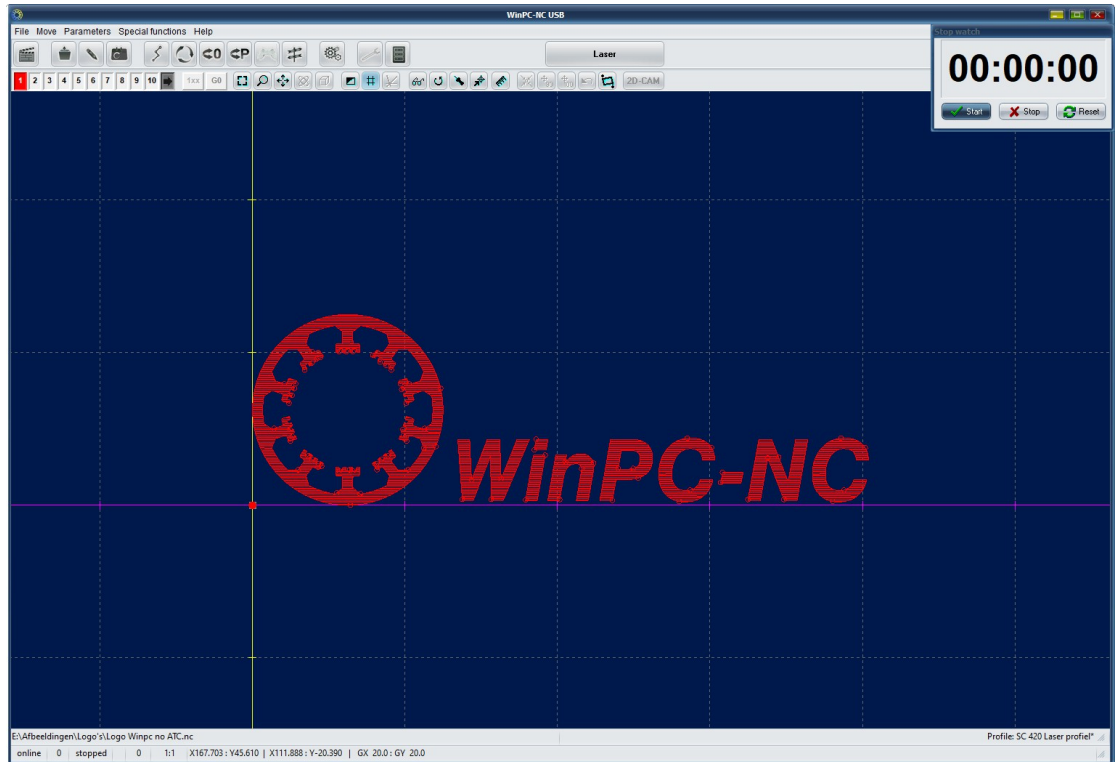
Figure 2 The 0.01% power dot

Note: Smoke retraction is very important to get a good clean laser beam and it keeps your laser last longer. On this machine there is a cone attached which is used for smoke retraction via vacuum cleaner, also it's provide a bit of protection against the laser light and has an air blast for killing flames on material.



Laser and *WinPC-NC USB*. Guide to your first (PWM controlled) laser project.

Load file ...



Load your file as usual, remember you're now in the Laser profile of your machine.

We only use one tool (Laser) and need no Z-axis movement other than determine the focus distance (new Z-zero point) of the used laser. (the NEJE has burning point distance between 30 and 50mm which can be focused)

In this example we are engraving the logo of *WinPC-NC* on Birch Multiplex (medium hard wood) and on Poplar triplex (soft wood).

With the **Laser Speed and Greyscale test** we found that engraving is best done with a feed rate of 1200 mm/min. and a Laser Power setting of 75 = approx. 30% power (1800 mm/min is the maximum speed of the Stepcraft 1/420 newer versions goes faster) but I don't fancy to push the machine to its limits.

First we open > Parameters > Technology > Tab Laser >

- Place a checkmark at the "**Automatic power reduction**" (APR)

We leave the Greyscale reduction for what it is for now.



Next determine the Z-zero height, for this laser between 30 and 50mm from workpiece. Focus your laser for the best height (38mm Z-height is here used as zero point).

If everything checks out ok, than go for it..... **Put on your safety goggles !!** Hit F3 and watch.....

After 8 minutes we can see the result on the multiplex plate

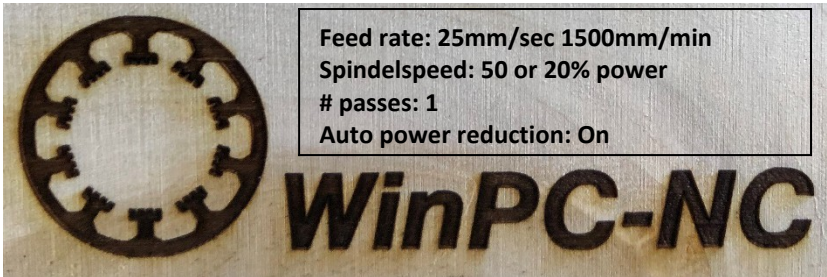


Figure 6 Birch multiplex

This is a nice burning result, the text and logo are nice black and the edges are sharp even the little detail on the inner logo circle (just 1mm wide) are visible.



Figure 5 Detail fig 1

Now let's test this on the poplar plate.

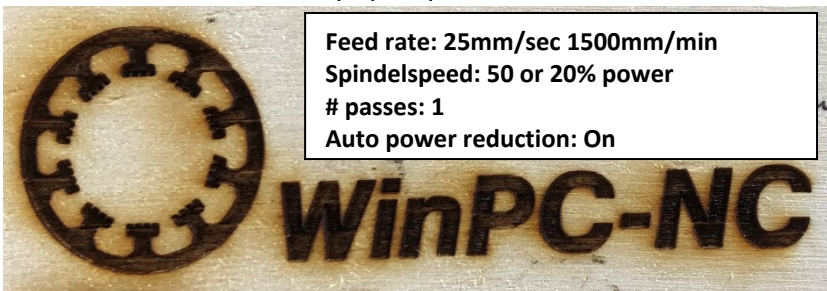


Figure 7 Poplar triplex

In this case you can see that even 20% power will burn the edges and makes the edges blurred, so we have to make a change to the power setting, this is done by trial and error.

So let's make another test run on Poplar triplex.

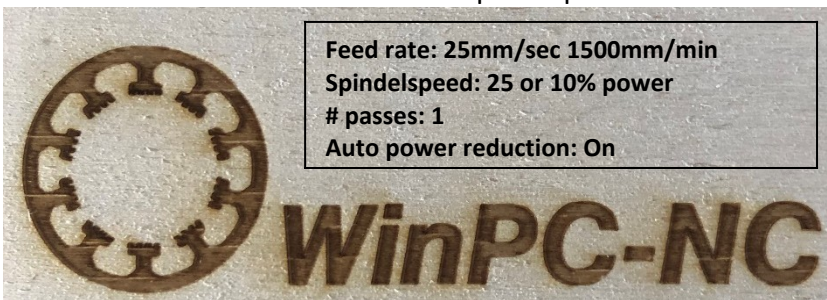


Figure 8 Poplar triplex

This is quite a bit lighter burned but with more detail, so the best result for Poplar triplex engraving should be around 15% power.

Conclusion:

Soft wood burns faster need higher speed or lower power.

Hard wood needs lower speed or higher power, sharp edges are best on hard(er) wood.



Laser cutting ...

Let's cut some material and we start with a poplar wood plate.

To find the right power for this job execute the "Laser Cut Test" first to get a good starting point. We have to do this for every new material we want to cut. (beware this test makes vertical lines)

Hint: When you use paper or other light material we have to fix them on the board, otherwise the little pieces are sucked up by the smoke exhaust. I use Spray glue on a spill board. Just spray the glue on the board and let it vapor for a minute or so. Now the board is sticky and hold the material in place but let it easy loose after finished job.

Remember, we still have the "Automatic Power Reduction" "apr" active this can be handy by cutting small objects like letters or so but for large forms who are in one fluent line switch it off.

First cutting run....

Poplar triplex wood...

We run the "Laser Cut test" on poplar wood (paper is used for this explanation).

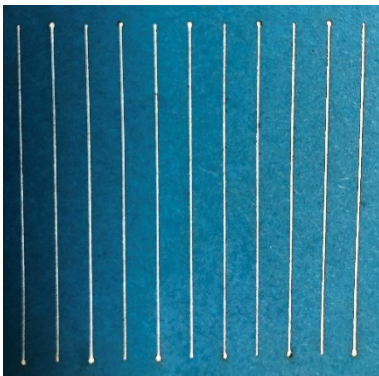
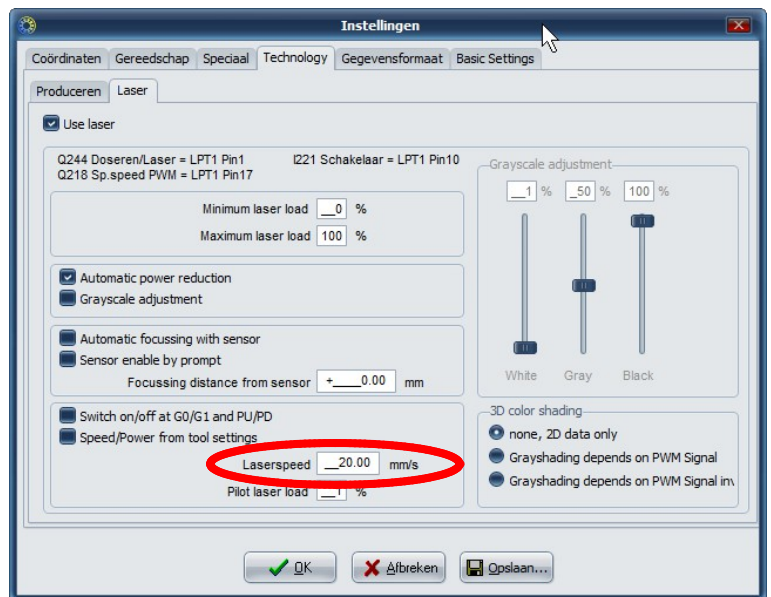


Figure 9 Laser Cut test on 80 grams paper

Read this test as follows from left to right is from fastest to slowest speed. The lines are numbered 11 to 01. The left line is the high speed of 1800 mm/min the most right line is 300 mm/min. (depends on the max and min speed settings you made in the test window)



On the Laser Tab you see the value calculated in the Laser Cut test is transferred to the field "laserspeed".

Beware: This value overrides the speed settings in the G-code, if you want to use the G-code speeds reset the value in the laserspeed field back to zero (0.01). Then the software controls the speed.

For Poplar triplex wood +/- 3 mm thick the outcome of the test is:

- Feedrate: 5 mm/sec 300 mm/min
- Power 100% (255 spindle speed)
- Auto PowerReduction OFF
- 10 passes
- If available use air blast to kill possible flames

Knowing that let's create a little house as a first project.

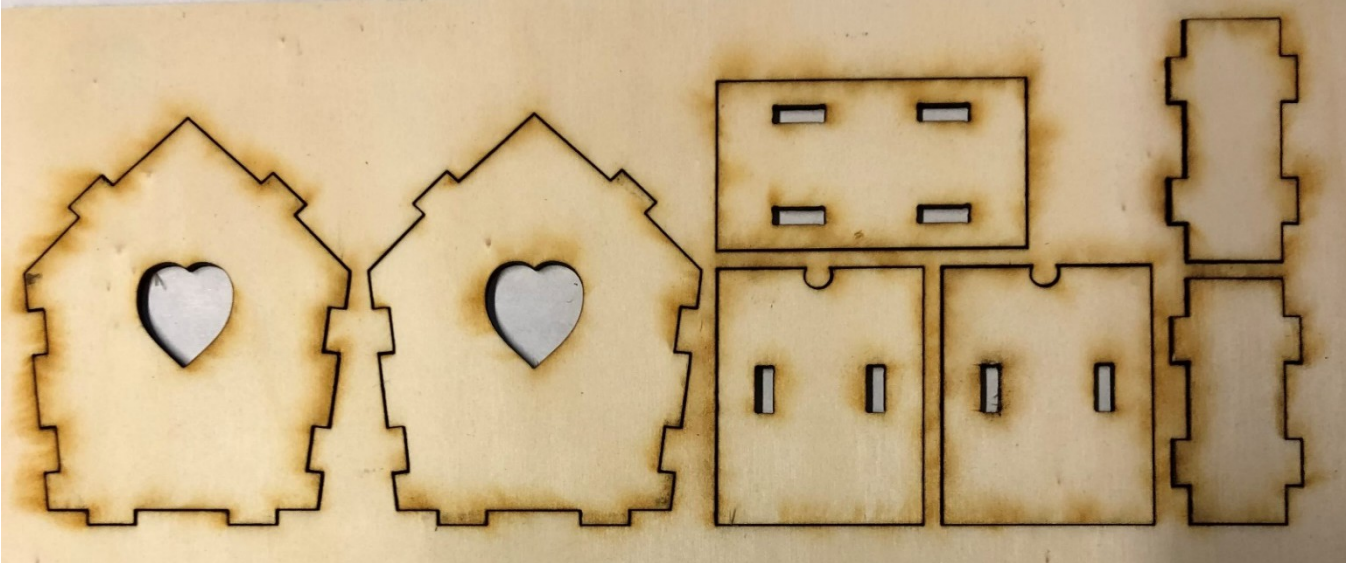


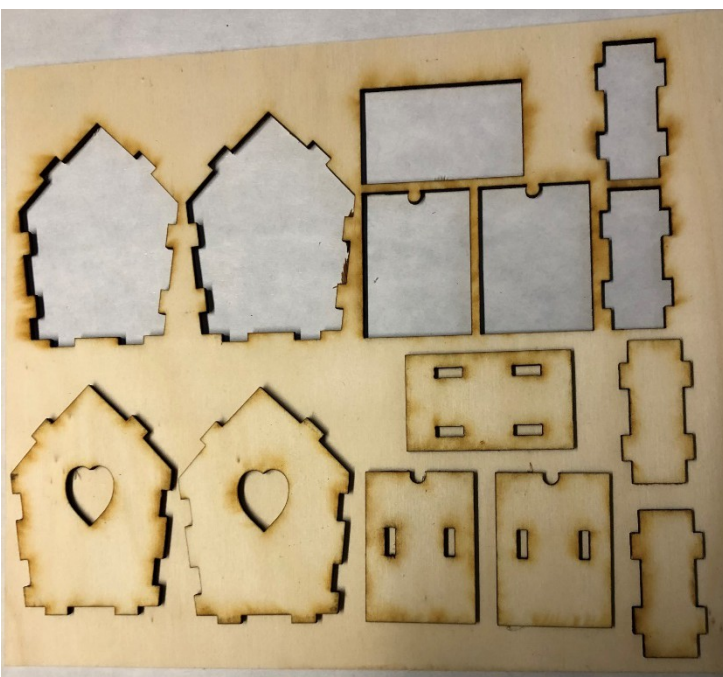
Figure 10 cut poplar plywood 12 passes

That came out just fine for the first time. Play with the settings of your laser and toolpath to get the right outcome for you.



Figure 11 Assembled house

Here some more samples for:





Balsa wood...

Now Balsa wood 2mm thick

Same as previous first Laser Cut test than run the logo

Made settings as follows:

- Feedrate: 8.33mm/sec 500 mm/min
- Power 100% (255 spindle speed)
- Apr ON
- 5 passes



Figure 13 Auto Power Reduction OFF

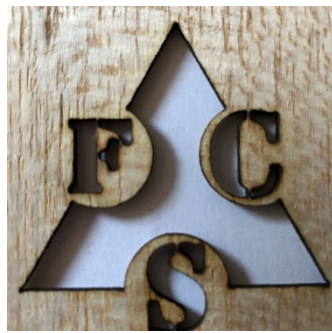


Figure 12 Auto Power Reduction ON

When APR is turned OFF the corners will be easily get burned spots.

Now Balsa wood 3mm thick

Same as previous first Laser Cut test than run the logo

Made settings as follows:

- Feedrate: 8.33mm/sec 500 mm/min
- Power 100% (255 spindle speed)
- Apr ON
- 8 passes

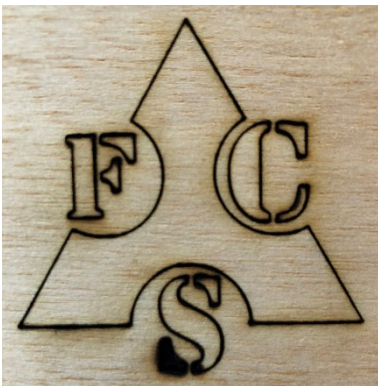


Figure 16 3mm Balsa front light burning

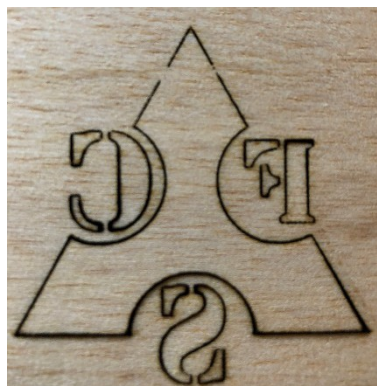


Figure 15 Backside two small spots not burned true



Figure 14 Result overall good

Now it's up to you.

Have fun.