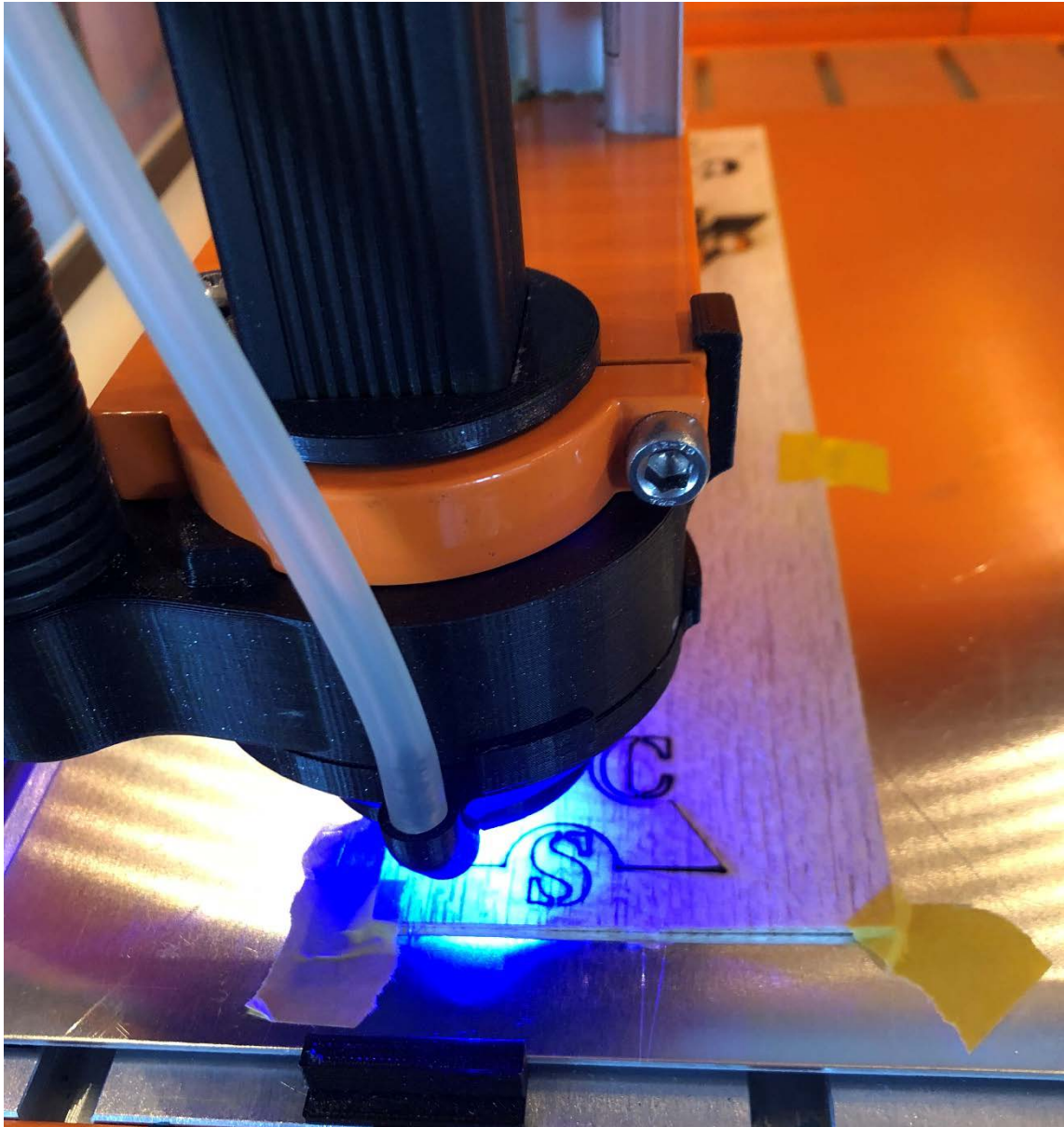## Install and connect a Laser module on your Stepcraft machine.

In this How to… I let you see how to make a 3rd party laser work on your CNC machine.

How to...

Used hardware.

This tutorial is written with the hardware.
- Stepcraft 1/420 CNC
- NEJE 20Watt blue (5.5Watt optic) laser 450nm.
- NEJE laser tester and control
- DS15 connector (male normal and female breakout type)
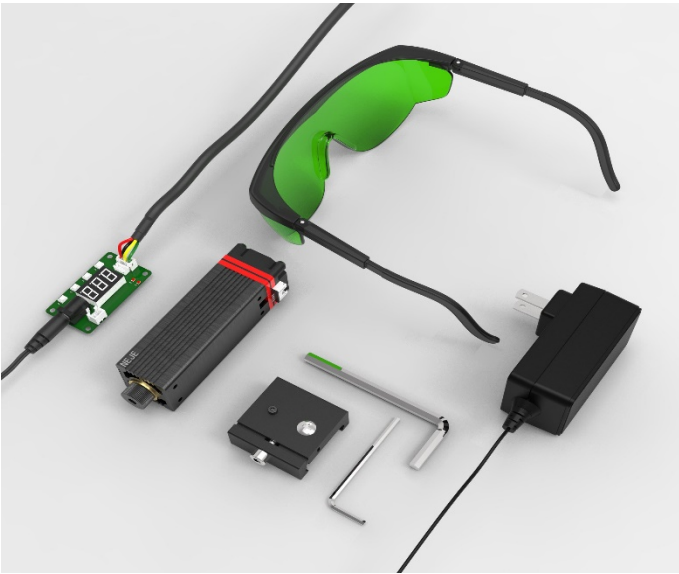- Several 3D printed parts

Figure 2 NEJE 20 Watt laser set

Figure 1 Stepcraft CNC

Make the laser fit.

The laser dimension are 30 x 30 x 80 mm and that doesn't fit in the 43 mm diameter toolholder.
So let's make an adapter for this.
I made one designing it in Solidworks and then printed it on the 3D printer.

The STL file can be found on Thingiverse : https://www.thingiverse.com/thing:4650032

The tight fit depends on the printer quality but with a piece of sticky tape on the laser it can be made a tight fit in the adapter.

Figure 5 Adapter for toolholder and laser

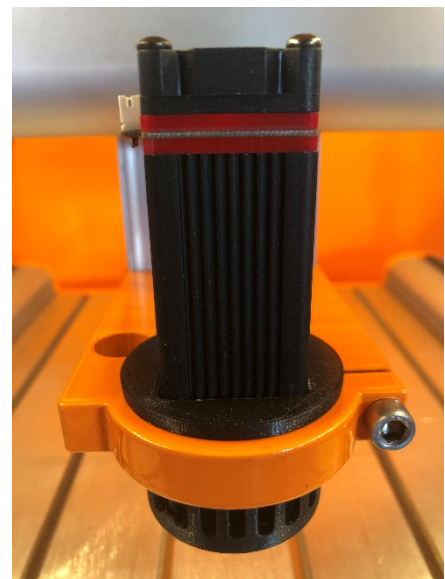*Figure 3 Adapter in toolholder*

Figure 4 Laser , adapter and toolholder

Hook the laser up to the Stepcraft.

Now we have make the connection between the Laser and the Stepcraft.
This is done by the Sub D 15 connector on the back of the Stepcraft machine. Because this auxiliary port is also used for the spindle control I made a Laser control box with an Sub D 15 out connector so that both laser and spindle can be used without changing connectors.

Hardware used for this:
- SD 15 Male connector soldering style
- SD 15 Female connector breakout style
- Old unused SCART cable
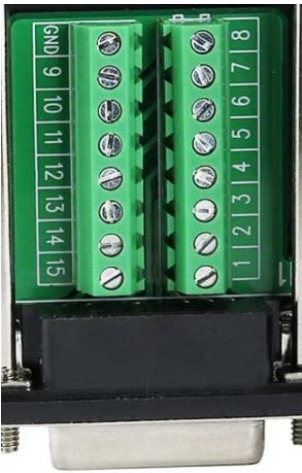
The SCART cable has 20 wires and we only need 15 of them just connect the wires on all the pins to make an extension cable. The male side goes in the Stepcraft machine and the female we mount in the control box. On this female we plug the Spindle connector now the spindle can be used when the laser is dismounted and vice versa.

Now we have to connect the correct pins on the female breakout connector to the laser tester print. Two extra wires are add to the breakout connector.
This is done on pin 2 or pin 10 (GND) and pin 13 (PWM on relay 1) and connect them to the PWM/TTL input pins (JST XH 2.5 2 pin connector).

PWM/Temperature tester board Specification
Power input: DC 12V
Output: PH2.0 4pin (12v,GND, PWM/TTL, Temperature)
mode: 3 modes (off, manual PWM, PWM / TTL in)
temperature display: YES
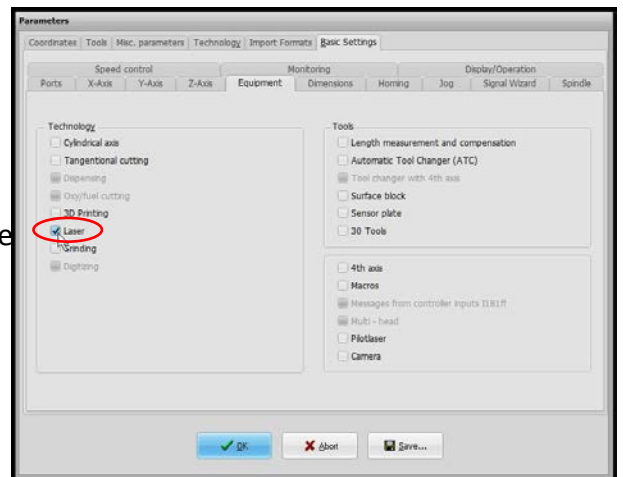PWM display: yes
Manual PWM control: YES

Next setup the CNC control program.
This tutorial is made for WinPC-NC USB ver. 3.40/82.

Step 1.
Click on Parameters, then on *basic settings*:
- Now navigate to the *equipment* window and activate the *laser*.

Step 2.
The output signals must be assigned according to their functions.

The following logic scheme applies:
Enable LaserQ244 Dispensing / Laser (e.g. Pin1)
Power LaserQ218 Sp. speed PWM (e.g. Pin17)

Switch to the Signal Wizard in parameters-basic settings and search for the corresponding signals in the lower output table. After that, every signal can be assigned with an output pin over the pull-down menu. Confirm each selection by clicking Accept.
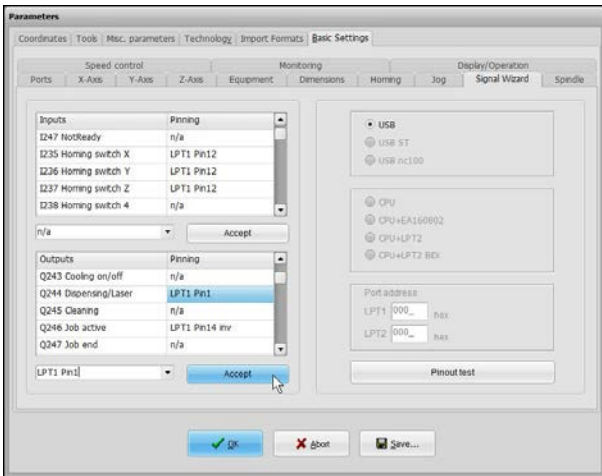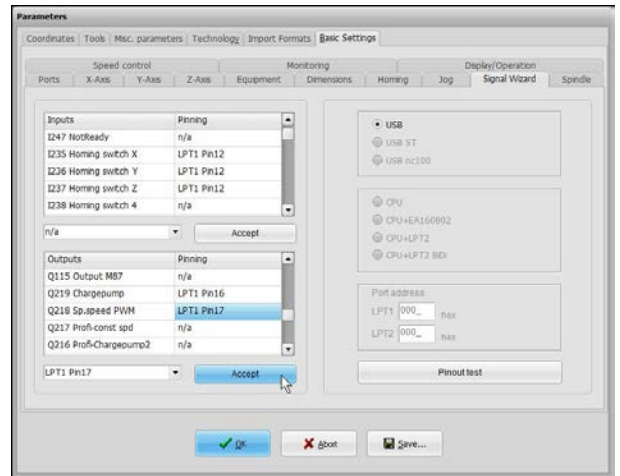
Figure 6 Assignment Pin 1

Figure 7: Assignment Pin 17

Now all basic connections and settings are made and the Laser should work and the power control is made by the toolpath file.

Note: Power setting is done by the G-code S command (0 = 0% - 255 = 100% power). This can also be done in the toolpath generator program by setting the spindle speed accordingly (0 – 255 speed).

To adjust the correct feed rate and laser power run before every different material the 2 special tests:
- Greyscale Speed test
- Laser Cut test

The calculated feed rate is inserted in the Laser tab file:

Note: This value overrides the G-code "S" speed setting!! So if you want to change the feed rate is must be done in the WinPC-NC Laser tab.
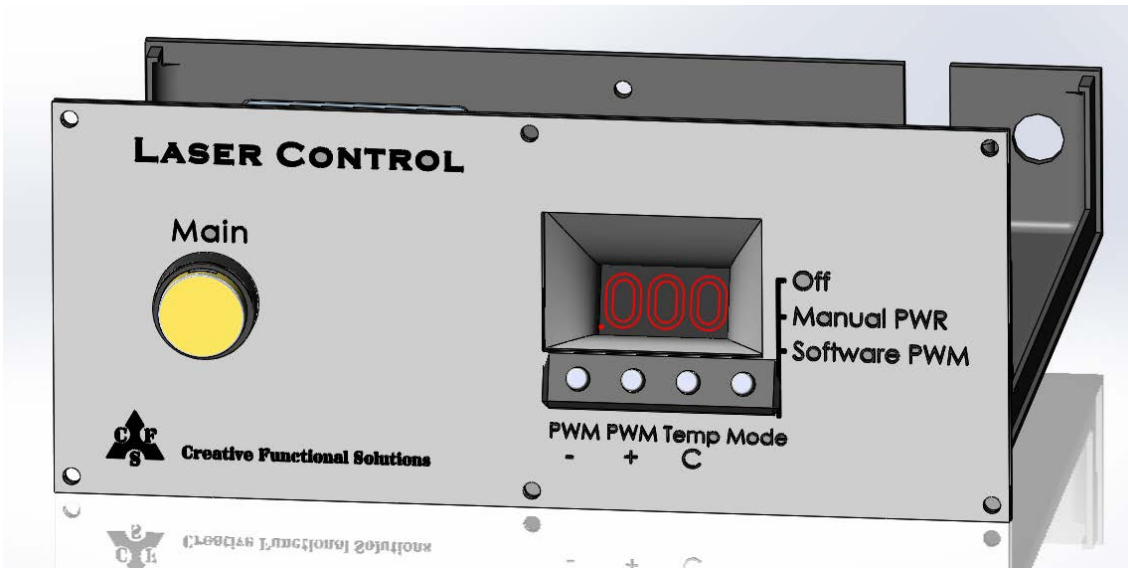
(To switch to the G-code setting the value of 0 should be entered in this field, only for now there is a bug in the software (reported to developer) so that doesn't work yet.)
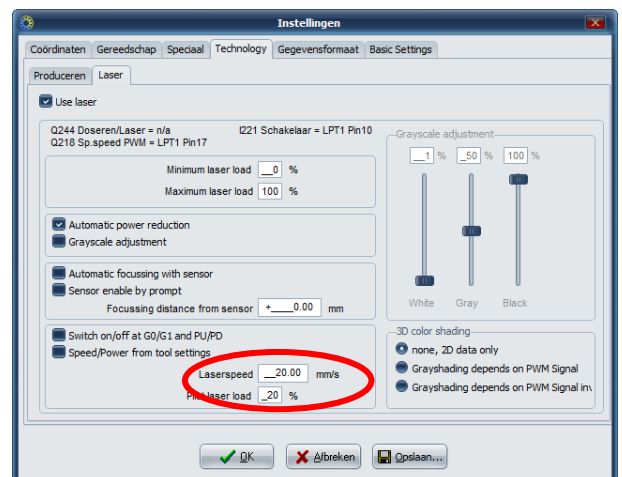
Now you can run your first test runs, have fun.

To fit all the components nice and ordered the Laser control box is made

The Laser control box will fit into the Stepcraft enclosure and is printed.
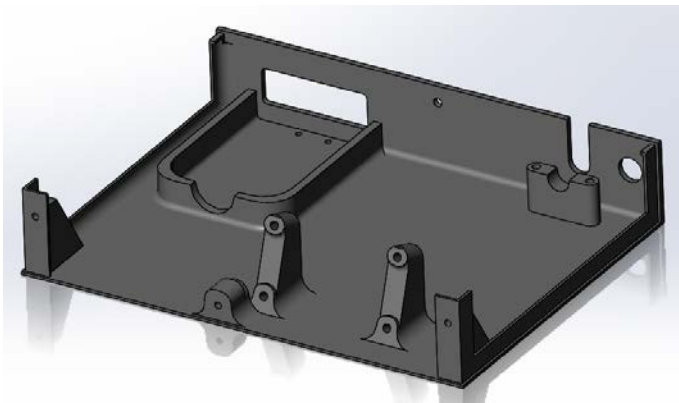The Laser control box STL files can be found on Thingiverse:

Figure 8 Bottom part Contrrol box