Liquid Crystal
MAGNA

Liquid Crystal
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Photocentric
STUDIO

Liquid Crystal
MAGNA
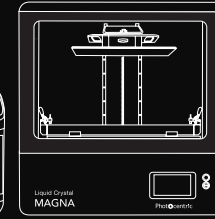
① PREPARE   **②** PRINT   **③** WASH   **④** CURE

THE PROCESS FOR PRODUCING DENTAL MODELS ON MAGNA

Photocentric

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DENTAL WORKFLOW

This workflow defines how to produce dental models for aligner manufacture, consistently, reliably to a very high level of resolution on the Liquid Crystal Magna 3D printer.

1- Minimum system requirements to run Photocentric Studio

- Windows 7, 8 or 10
- Minimum 2.0 Ghz processor speed 2 Cores. Recomended 4 cores.
- GPU capable of running opengl version 3.0 or higher. We recommend that you use GPU with at least NVIDIA GTX1050 specifications.
- .net framework version4.0
- 64bit system: minimum 2Gb of Ram, recommended 4Gb.
- 32bit system: minimum 1Gb or Ram, recommended 2Gb

You can run the software using MacOS by using a virtual workstation with Windows installed on it.

- Your system could operate with an intergrated or a non-intergrated graphics card. Photocentric Studio by default may run with the intergrated graphics card. To check this click 'File', 'Configuration', 'General Settings', 'Logging' (figure 1).
- If yes follow these steps to enable Photocentric Studio to run with the non-intergrated graphics card.
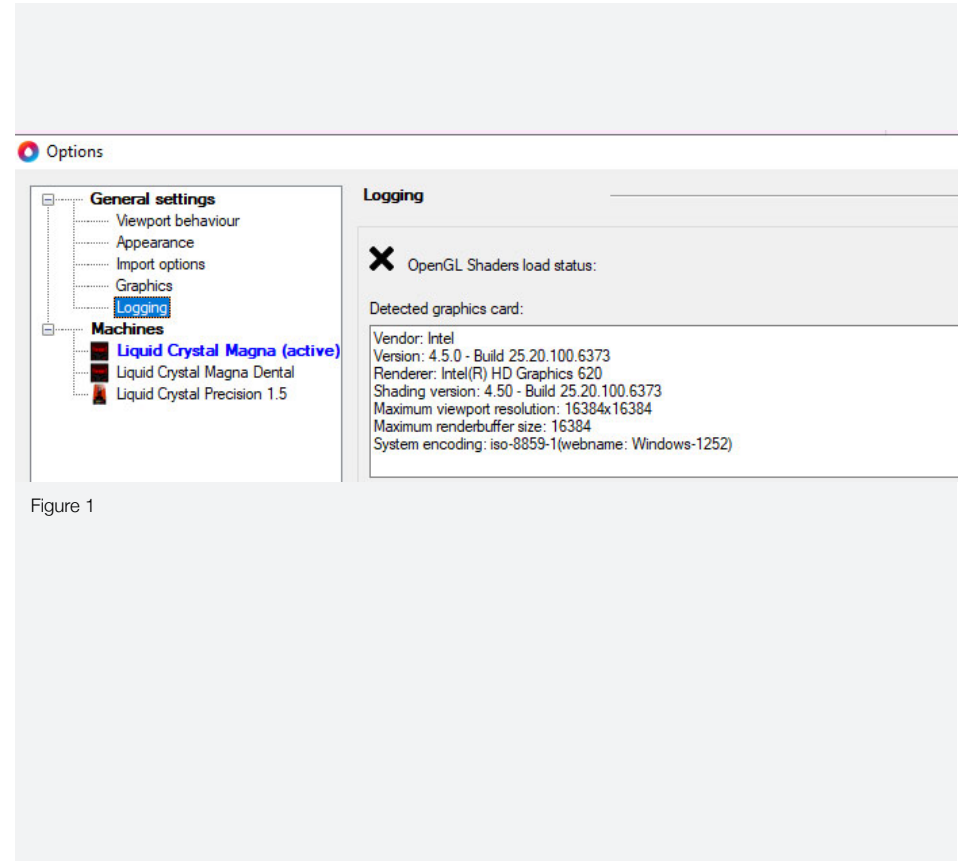
Figure 1

1. Right click on your desktop and select NVIDIA control panel (figure 2)
2. Select 'Program Settings', click 'Add' (figure 3).
3. Select 'Local Disk (C), 'Program Files', 'Photocentric', 'Photocentric Studio' then click 'Open' (figure 3).
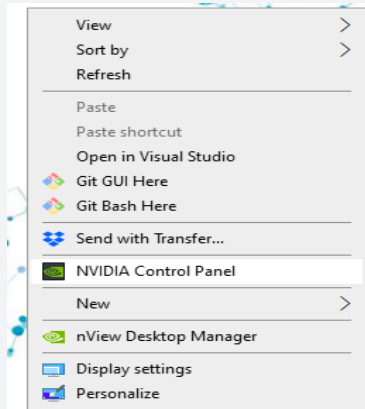4. Make sure 'Preferred Graphics Processor' is 'Nvidia Processor' (figure 4)
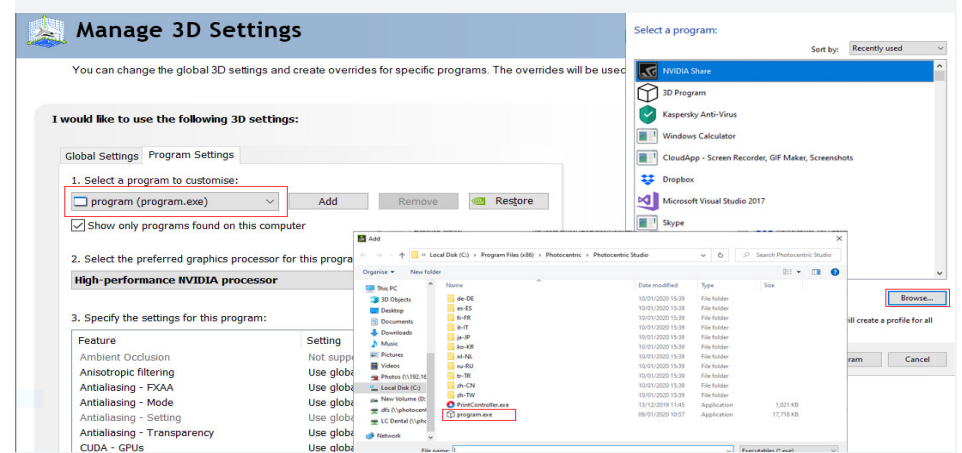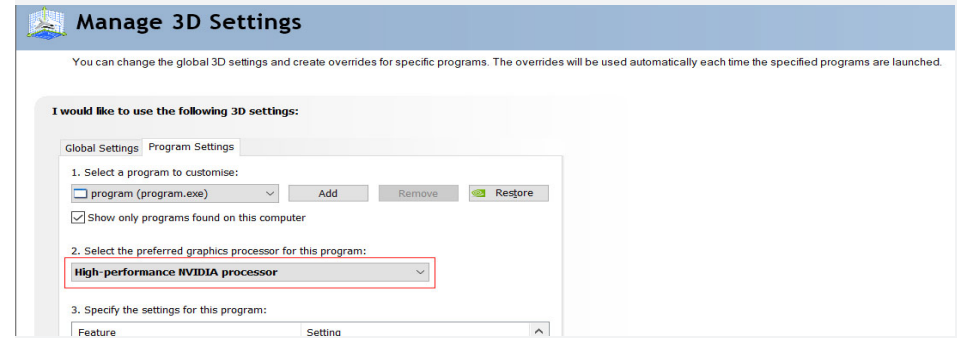

Figure 2

Figure 3

Figure 4

Loading files

- Open Photocentric Studio. Check your version is the latest one by visiting our website and comparing to your one in 'Help' and 'About'.
- Select 'Liquid Crystal Magna' and 'Dental Model Beige 100um' (figure 5).
- Click 'File' and 'Import File' to open your file in Photocentric Studio (Figure 6).

Mesh Fixing

- To diagnose if any of your imported files has a mesh error, look at the top right window for yellow warning triangles (Figure 7).
- Select the model and press 'Delete' key on your keyboard to remove it.
- You can repair the faulty model with '3D Builder' software.
  3D Builder Software' is a free app built for Windows to prepare, view and print 3D models. You can download the app from Microsoft online store.
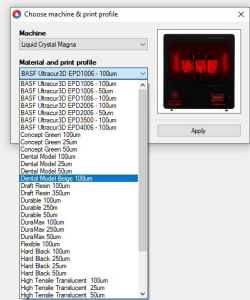- Find the faulty model file's location on your PC and open it with '3D Builder' (Figure 8).
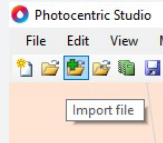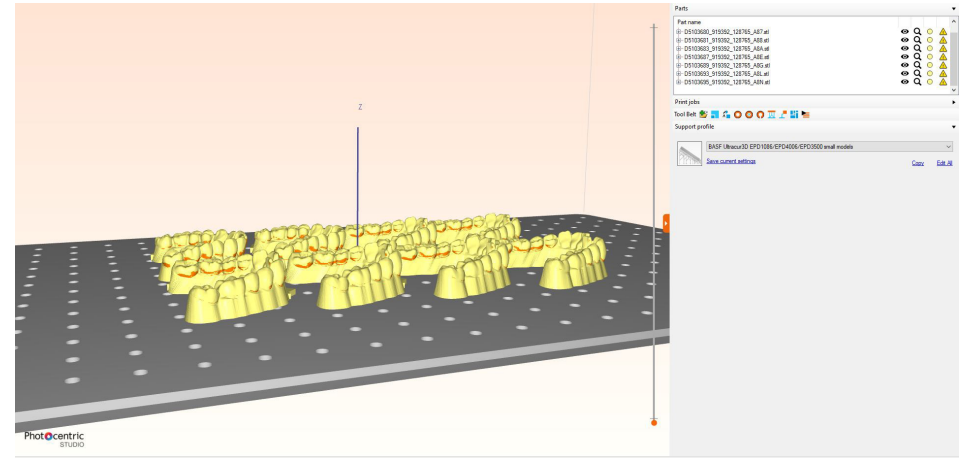

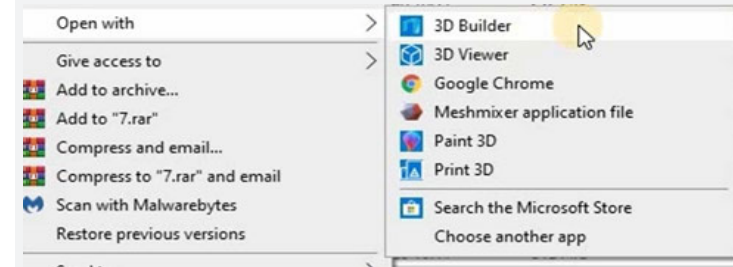Figure 5

Figure 6

Figure 7

Figure 8

- Press 'Import Model' to allow '3D Builder' to check the mesh integrity (Figure 9).
- Click on the error message appearing on right bottom corner to repair the model (Figure 10)
- Press 'Save As' (Figure 11).
- Find the faulty model's file location. Save the model as STL or OBJ format. (Figure 12).
- Replace the faulty file with the corrected one (Figure 13).
- You can drag and drop the updated file into your Photocentric Studio preloaded platform (Figure 14).
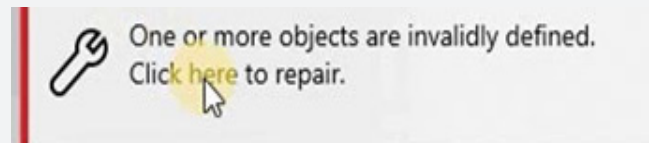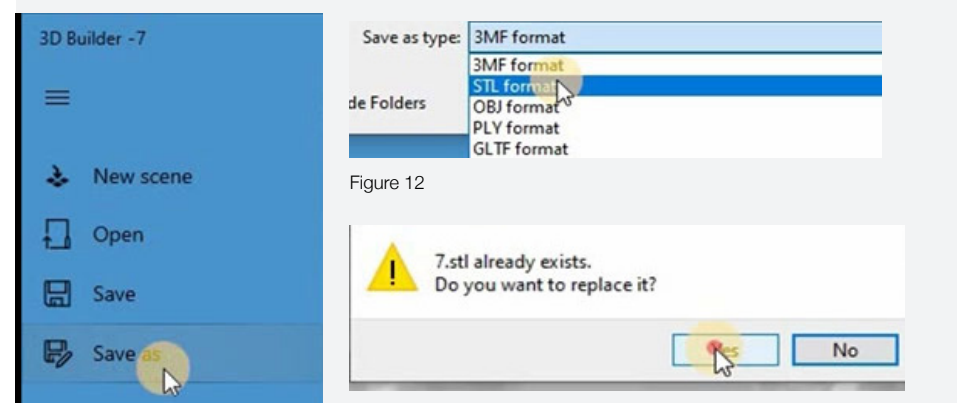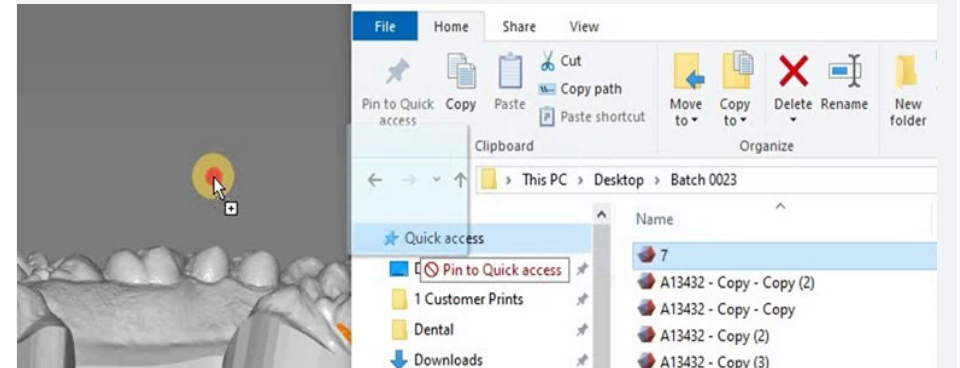

Figure 9

Figure 10

Figure 12
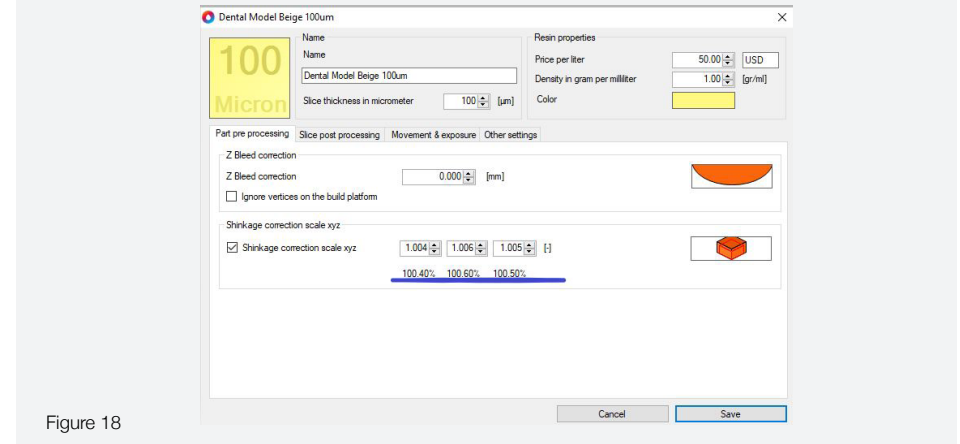

Figure 11

Figure 13

Figure 14

Scaling

If using the recommended Dental Model Beige, scaling has been set in the profile so this will not be needed.

If using Dental Model White click on a model and press 'Ctrl + A' to select all models on the platform. Click the icon shown in Figure 15. In the scaling window adjust 'uniform in all directions' to 1.005 to increase by 0.5% in the X,Y, and Z axes (Figure 16).

To preset the scaling function when using Dental Model White:

- Click 'File' then 'Configuration' and select 'Liquid Crystal Magna' in the machine tab. In 'Print Profiles' double click on 'Dental Model 100um' (figure 17).
- In 'Part pre processing' tick the 'shrinkage correction scale xyz' box and enter '1.005' in the x, y and z boxes. Click 'Save' and then 'Save and close' (figure 18).
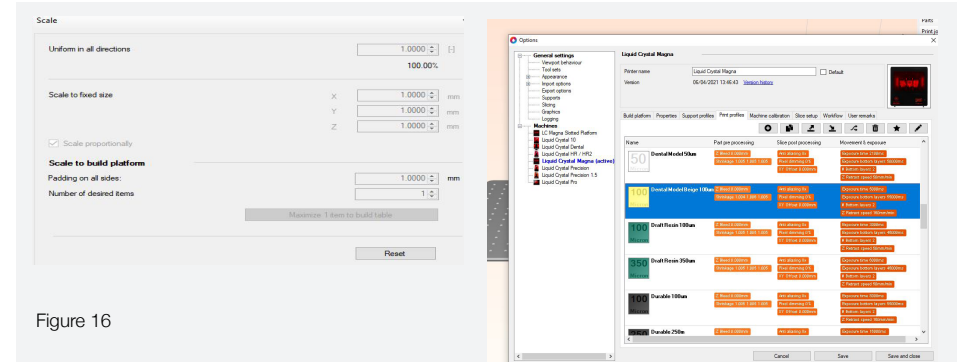

Figure 15

Figure 16
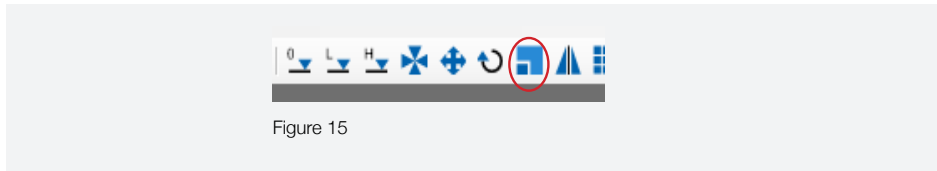
Figure 17

Figure 18

Hollowing

We recommend using solid models for this process.
If you wish to reduce resin usage and hollow your models you can do this by clicking on the model. Select 'Mesh' and 'Hollow Mesh' or select the 'Hollow Mesh' icon (it will highlight, Figure 19) and choose '2mm' wall thickness, leaving the rest of the parameters as in the default, then click 'Hollow Mesh' (figure 21).
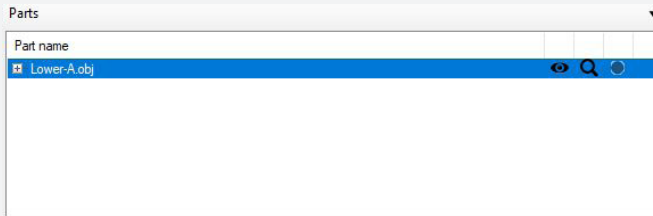
Figure 19

Figure 20

Hollow mesh

The hollow function will make your model hollow by inserting an offset. With the resolution parameter yo the size of the sampling grid and thus the size of the triangles in the offset. It is estimated based on your

Hollowing settings

Wall thickness   1.0

Resolution

▲ **Recommended**

Reduce mesh

☑ Optionally mesh reduce the generated offset.

Reduce by

☐ Switch to transparent view mode

Figure 21

Infilling models

- To increase the rigidity of your hollow models you should add an infill by clicking the 'Infill' button. We recommend a 1mm 'Infill diameter' and 4mm 'Cell Size'. Select transparent view mode to see the lattice and then press 'Generate Infill' (figure 22).
- Click 'Display Mode' and select 'Shaded Mesh' to return to solid view (figure 23).
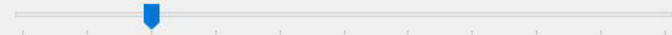
Adding drain holes

- It is essential to add drain holes to hollow models to avoid print failure,
- Add three drain holes per dental model, one in the middle of the arch and one on each of the legs. In 'Mesh' select 'Add drainage hole' or select 'Flexible drain hole' icon (figure 24).

Figure 24

- If the model has a solid floor, position the hole above the floor (figure 25). Click the cursor to make three holes. Click "Add flexible drainage hole" or Esc to release.
- Select all three holes, and set the diameter to 3mm and click 'Apply Selection' (figure 25).

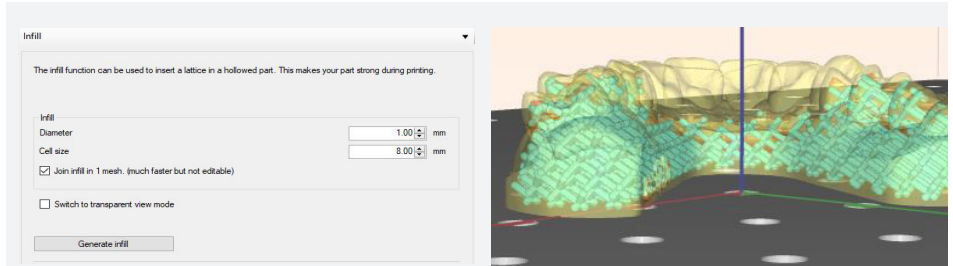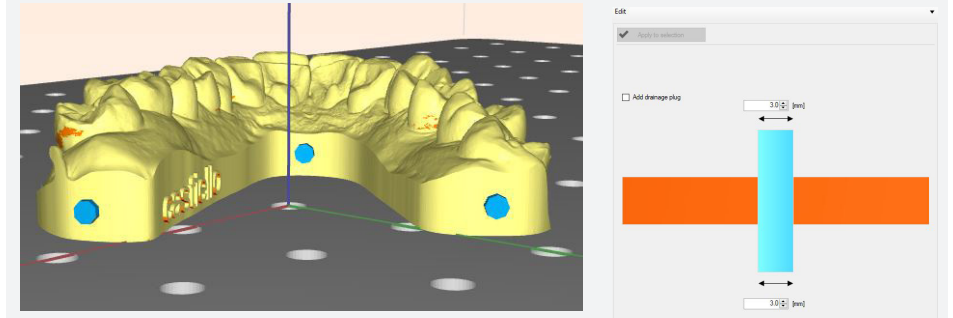*Note: Drainage holes will be formed during slicing.*

Figure 23

Figure 23

Figure 25

- If your models are already hollow before you imported them into 'Photocentric Studio' and they don't have a floor, add 3 drain holes by following the steps in the previous section and postion them above the platform (figure 26).

Optimising the orientation of the models

- If your models have not been imported flat to the build plate you will need to manually rotate them. Click the 'Move' button (Figure 27), on the right hand side you will see the rotation section (Figure 28) adjust on either the X or Y axes until parallel to the platform.
- If the model does not load at a 90° angle to the platform, use the 'Orient to face' function (Figure 29). Move the cursor to the bottom surface of the model and click (Figure 30). Repeat this process for any other models.
- Alternatively, you can orientate your models in your dental design software before you import them into Photocentric Studio.
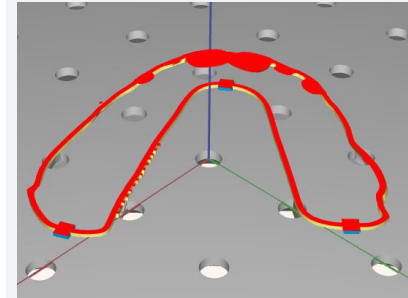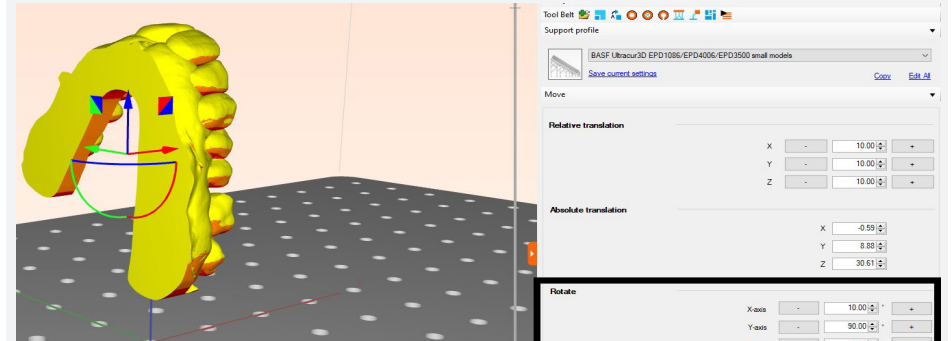
Figure 26

Figure 27

Figure 28

Figure 29

Model nesting

- The nesting is quicker if you have followed the orientation advice from previous sections (See. Optimising the orientation of the models). You may need to make manual adjustments to the dental model locations once the batch process has finished for best fit. This is typically to rotate adjacent models to maximise use of empty space; always using a minimum of 2mm separation.

- To batch process a full bed of models, click 'Move' and 'Nesting' or click the 'Nesting' icon (Figure 31).

- Make sure 'Lock Rotation' & 'Overlap Baseplates' are unchecked (Figure 32). Now set the 'Object Margin' to 2mm.

- If the number of models is less than 30 increase the 'Object margin' to 3mm maximum.

- Click 'Start nesting'. This will take longer based on the 'Number of part rotations to try' function.

- If the number of models is less than 10 you should space them out evenly across the platform.
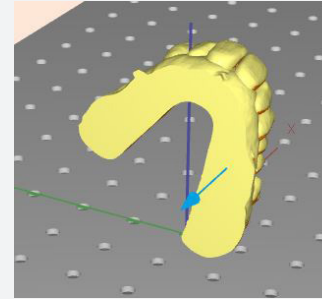
Figure 31

Figure 30
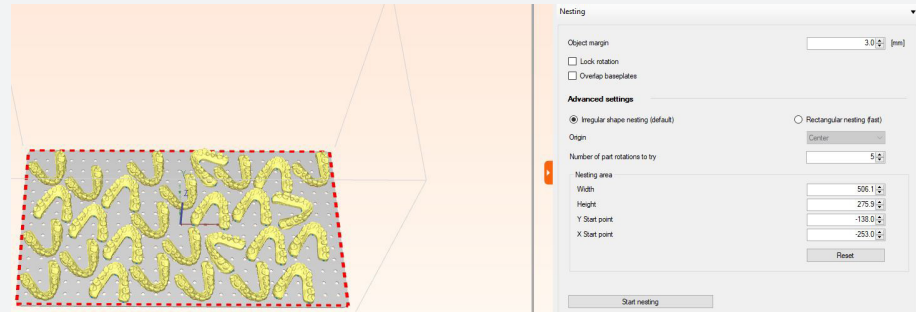
Figure 32

- Use the 'Slider', on the right hand side of the screen, to check that all bottom layers are attached properly to the platform. If they are not use the 'Orient to face' function (See, Optimising the orientation of the models).
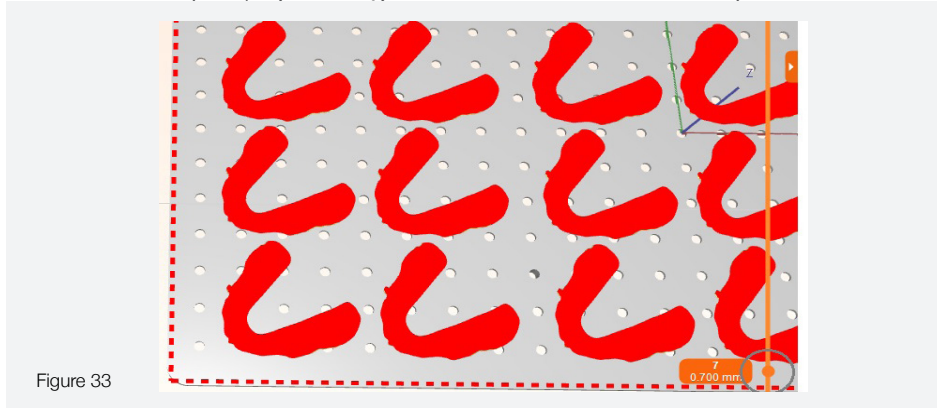
Figure 33

Slicing Files

- In "slice" click 'Start Slicing' or click the "Slice" icon (Figure 34). Select the location to save your file in and click 'Select Folder'. You can now rename the file. Click 'Ok Start Slicing' (Figure 35).
- Note the estimated volume of resin needed, shown on the right hand side of the screen under your machine selection (Figure 36).
- Note the print time as this is more accurate than the initial completion time made on the printer interface.
- To transfer your files to your printer see your LC Magna User Manual for full instructions.

19

Figure 34

Figure 35

Figure 36

20

2- Print

- Make sure your print platform is fully clean with no cured resin on any area. Cured resin can pierce the vat film and cause vat leaks. You can use an air gun to fully remove any stubborn pieces of resin.
- Tighten the central knob so there is no free movement in the platform.
- Check the blow peel gasket is sat correctly on the perimeter of the screen protector with no kinks.
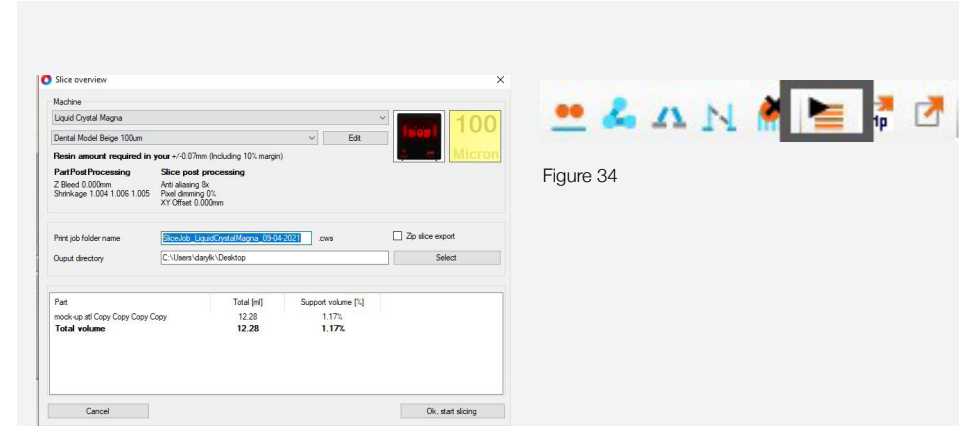- Before starting the print make sure the vat is completely clean, damage free and has high tension. If there is a small hole (<1mm) you can use clear Sellotape to cover the hole. Be aware that this may leave a small line on the models so this should be done at your discretion.
- To reskin the vat, watch our vat reskinning video (accessed on our LC Magna support page).
- Always bolt/clamp the vat down before printing.
- Now test the blow peel is working by pressing 'Maintain' then 'Pump' and 'Test'. You should see the film rise and fall, you can feel the air pressure with your hand. Press 'Main' to return to the main menu.
- Always add resin that is at least at room temperature (>20°C / >68°F), if not warm it up.
- Shake the resin bottle before adding to the vat to make sure any pigment/settling is mixed in.
- Pour in the required amount of resin (take the total that was calculated by the software that you noted earlier and add 1.5). The vat is marked with the 1.5L volumes.

- Close the door. Press 'Print Files', select your loaded file (it will become highlighted) and press 'Print'.

3- Wash

- Fill your Airwash unit with 90L. of Photocentric Resin Cleaner, which can be used to wash in excess of 200 platforms of prints.
- When your print has finished, loosen the platform knob, remove the platform and hold it vertically over the vat to allow the excess resin to drain back in the vat.
- Place the platform into the Airwash L using the bracket supplied.
- Turn on the Airwash L and leave platform inside for 10-15 minutes, maximum.
- After 16 minutes, take the platform out and place it over a rinsing tank to thoroughly rinse any remaining Resin Cleaner from the parts and platform. You Use hot water to rinse away any residual cleaner.
- Any residual cleaner will leave a tacky surface finish on your models, Resin Cleaner should not be disposed off down the drain, but should be collected for disposal.

4- Cure

- Set the temperature controller to 65ºC, 149ºF and pre heat by setting the timer to maximum.
- Your Cure L2 will heat up quickly so you can place the full platform in before switching on.
- Place your platform on the arm at the top of the Cure L2 and close the door. For Magna Dental White or Beige post expose for 60 minutes at 65°C. Or, until you have a smooth dry surface.

5- Parts Removal

- The most effective way to remove your models is to use Thermal Shock. While the platform is still hot from the Cure L2, and wearing gloves, place the platform into a vat of cold water or run cold water over all models. The models will then either pop off the platform or be very easy to remove by hand.
- Carefully slide the spatula under each arch in the front facing center part. Do not try to remove by moving the spatula up, this will cause models to break.

6- Housekeeping

- It is recommended to clean the vat between each print.
- You must keep the platform thoroughly clean. Leaving no cured pieces of resin on any part of it. Use an air gun etc.
- If you have had a print failure, thoroughly clean the vat and platform and check the vat film has not become damaged.
- When you have become experienced using Magna you can clean your vat before you begin printing for the day. If you have numerous successful prints, it is recommended that you use the plastic squeegee to 'wipe' the bottom of the vat to mix the resin.
- If there is a print failure clean the vat out and filter the resin.
- If a sudden loud beeping noise occurs, you have had a vat leak. This noise is the vat leak sensors being triggered by resin entering the blow peel system. You will need to carry out the sensor cleaning procedure (See, Troubleshooting on Magna Resource Hub).
  https://photocentricgroup.com/lc-magna-resource-hub-troubleshooting-software/