Instructions for Making

Design lens molds in Autodesk 123D Design

1. Open Autodesk 123D design software on your computer.
2. If you are using a 3 button mouse to control the cursor, know that the clicking the left button will allow you to select items, clicking and holding the scroll button will allow you to pan from side-to-side or up-and-down, and clicking and holding the right button will allow you to rotate the view side-to-side or up-and-down. Using the scroll feature or the scroll button will allow you to zoom-in and zoom-out. Unless otherwise stated, anytime we say “click” in our instructions indicates a click of the left button on the mouse.
3. Take a look at the screen view. Make sure the units indicated in the “Units” box on the lower right hand side of the screen says mm (millimetres). Change units to mm if not currently in mm.
4. In the upper right hand side of the screen, there is a cube that indicates the different 3-D views we can have of the object. Move your cursor to select the top view.
5. Use the scroll wheel to zoom-out and click and hold on the scroll wheel to pan the view so that you are looking at the centre of the grid.

Drawing the well

6. Move the cursor to the buttons at the top of your screen. Click on the “Sketch” icon and move to select “Sketch Circle”.
7. Before sketching the circle, you must click on the grid. Click on the grid, and click anywhere on the grid to indicate the centre of your circle.
8. Move your mouse until a diameter of 80mm is reached, click the left button, and then click on the “Exit Sketch” icon (the green box with the check mark) to complete the circle sketch. Alternatively, you can enter the circle diameter of 80mm by using the keypad on your keyboard, pressing enter once to lock in the dimension, and pressing enter a second time to exit sketch.
9. Move to the top of the screen and click on the “Sketch” icon. Select “Polyline”.
10. Click on the circle before you beginning drawing the line. NOTE: if you are modifying an object, you must click to select your object before starting any function so that the program knows that you are modifying the object and not starting a new one. Therefore, in this case, click on the circle before sketching to indicate that you are adding the line to the sketch and not drawing a separate unrelated line.
11. From the point on the circle that is directly to the right of the centre point or the circle, count 3 vertical grid lines to the left. Then, move up this vertical grid line and count 3 horizontal grid lines above the point where the circle intersects with this vertical gridline. Click this point to indicate the start of your polyline. Note: each grid line represents 5mm.
12. Move your cursor down the vertical gridline and click on the point that is 3 horizontal grid lines below the point where the circle meets the vertical gridline. Click on the “Exit Sketch” box to complete the line.
13. Click to select your object. You’ll notice a square icon appears close to where you clicked on the circle. Hover over the box with your cursor and other options appear. Click on the “Mirror” icon.
14. Notice that a box titled “Sketch Entities” and a box titled “Mirror Line” appear. Make sure the “Sketch Entities” box is the one that is selected. Click on the circle to indicate that the circle is the object to be mirrored.
15. Click on the “Mirror Line” box. Click on the vertical line to select this to be your mirror. Click on the exit sketch box to complete mirror function.

16. Move to the top of the screen and click on the “Sketch” icon. Select “Trim” feature.
17. Click to select your object. Move the cursor over the curve you want to remove and click on the curve to remove it.
18. Click on the “Exit Sketch” icon when you have removed the curves so that a double convex object remains. This space represents the well you will pour the gel-wax into to create your lens.

Making the rim of the mold

19. Move the cursor to the buttons at the top of your screen. Click on the “Sketch” icon and move to select “Sketch Circle”.
20. Click to select the lens well. Then, use the same point as the centre of your new circle.
21. Click the centre point and create a circle that is 83mm in diameter. Click “Exit Sketch” icon when done.
22. Click to select the 83mm circle you just created and perform the mirror function again.
23. Move the cursor to the buttons at the top of your screen. Click on the “Sketch” icon and move to select “Trim”.
24. Click to select your object and trim the curves like last time. What remains is a double convex within a larger double convex – the space between will become the walls to the lens.

Making the handles

25. Move the cursor to the buttons at the top of your screen. Click on the “Sketch” icon and move to select “Offset”.
26. Click to select the object. Then, click the centre line and move slightly to the right. Using the keypad, enter 1.5mm as the offset distance and hit enter.
27. Select the “Offset” function again, selecting the object and the centre line. This time, move the line slightly to the left. Using the keypad, enter 1.5 mm as the offset distance and hit enter.
28. Move the cursor to the buttons at the top of your screen. Click on the “Sketch” icon and move to select “Polyline”.
29. Click to select the object. Using the Polyline function, draw straight lines to connect the ends of the 2 lines you created using the Offset function. The result looks like a long vertical rectangle that cuts through 2 double convex shapes.
30. Move the cursor to the buttons at the top of your screen. Click on the “Sketch” icon and move to select “Trim”.
31. Click to select the object. Use the Trim function to remove all the lines such that you are left with the following sketch. You should see a well that is surrounded by 2 identical rims that are mirror images of each other.

Going to 3D with a 2D sketch

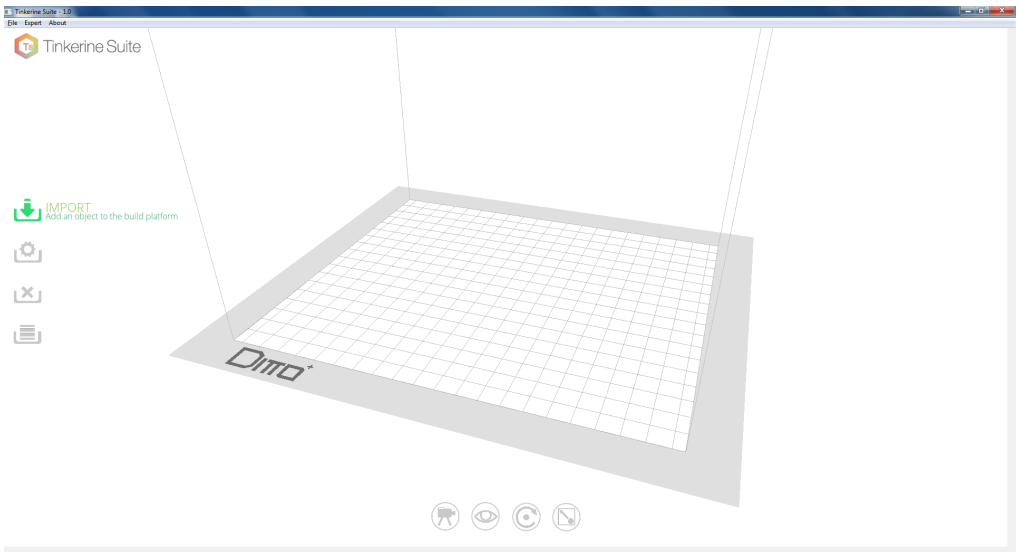
32. Move the cursor over the left rim so that the entire rim glows green. Click to select the left rim.
33. Holding down the Shift key, click to select the right rim as well.
34. Select the “Extrude” function. Using the keypad, enter 1.5mm.
35. You now have a 3D lens mold. We now need to separate the rims so that it will be easier to remove the molds once they are cast.
36. Move the cursor to the buttons at the top of your screen. Click on the “Modify” icon and move to select “Split Solid”.
37. Click to select the object as the “Body to Split”.

38. Click on the box that says “Splitting Entity”. Click to select the centre vertical line and hit enter. The 2 rims should now be split apart.
39. Click to select the right rim. Select the “Move” function, and click and hold on the arrow pointing to the right (this will move the rim to the right). Using a keypad, enter 3.0mm.

3D Print lens molds

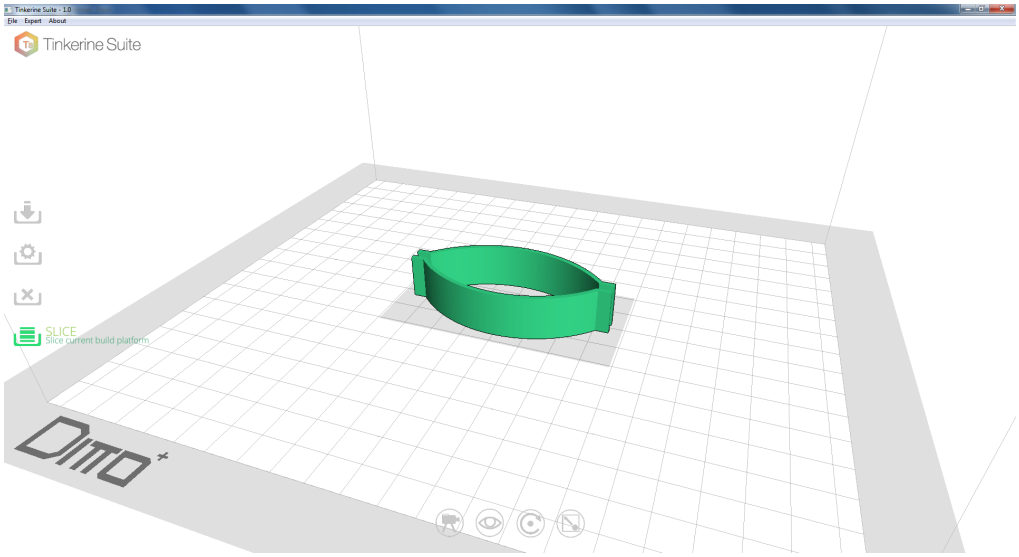
Lens mold dimensions: 70 mm (w) x 33 mm (d) x 15 mm (h)
Approximate print time for 1 lens mold: 24 mins

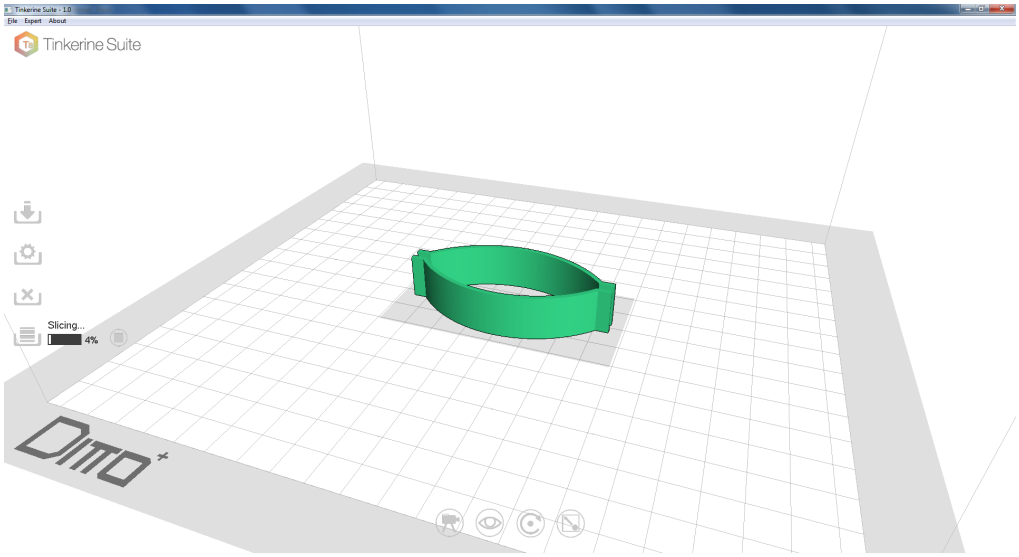
1. On your computer, open Trifecta™ software. Insert SD card into computer at this time as well.
2. Import your STL file



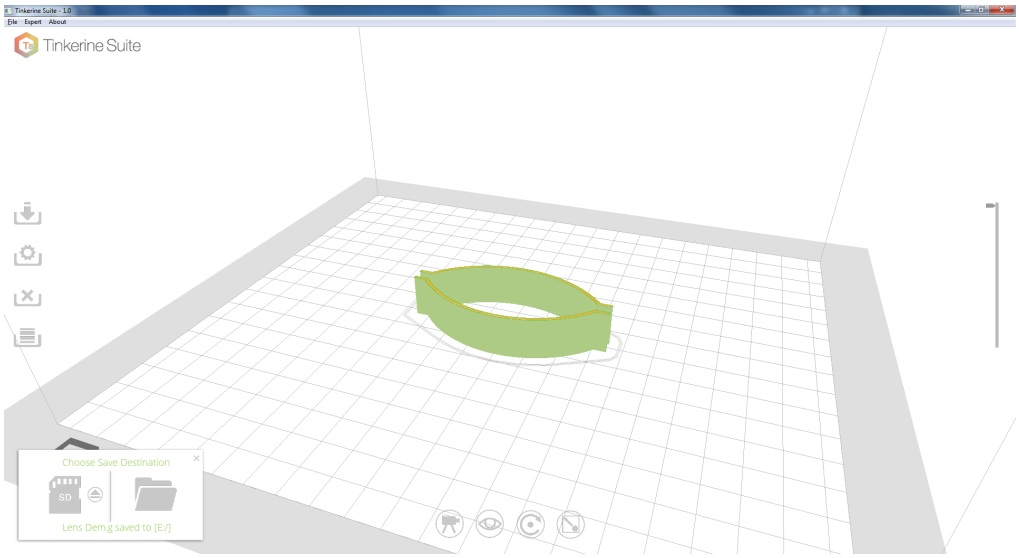
3. Click the Settings button and click the down arrow to display all the options. For this print job, use the following settings: Resolution: Medium; Infill: 4%; Walls: 3; Speed: 65 mm/s; Filament: 1.75; Support: Off; Angle: 65°; Temperature: 215°C – Hotend

4. Click the Slice button to start slicing the object.





5. When finished, save the file (now called g code or g file) to the SD card.

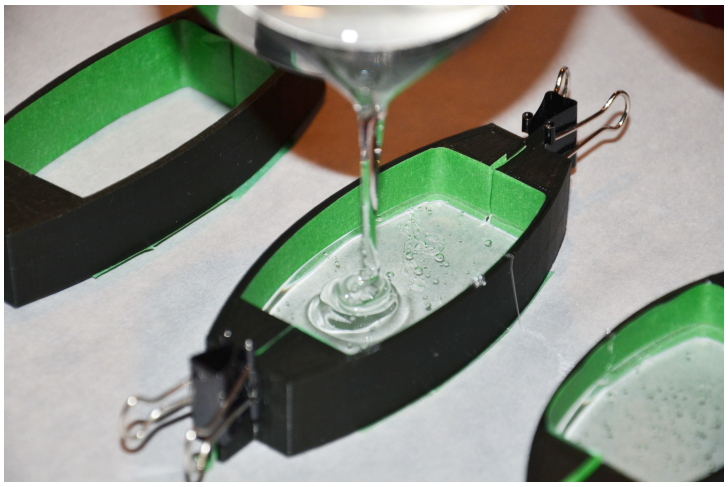


6. Remove SD card from the computer
7. Turn on Trifecta™ 800 printer and insert into the printer control panel.
8. Click on knob, scroll down to “Print from SD”, and click on knob again.
9. Scroll down to find your file and click on knob to start printing. Note: printing will not begin until the hotend is warm enough.

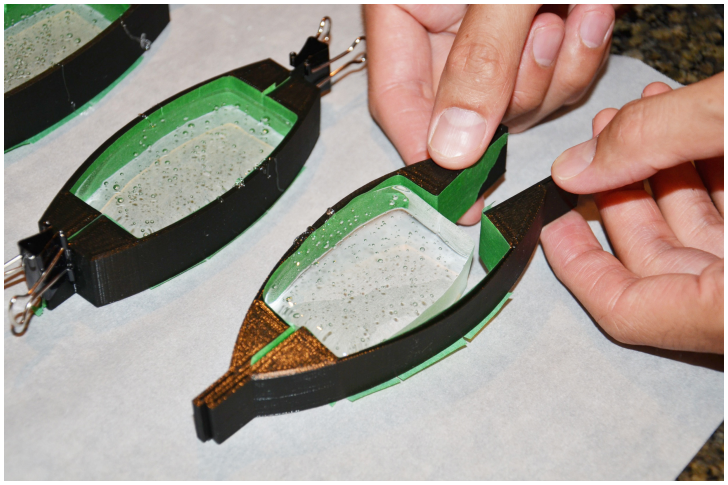
Cast lenses using gel wax

(before casting, you will need 2 binder clips for each mold, painter's tape, a sheet of parchment paper, and gel wax)

1. Preheat oven to 230°F (110°C).
2. Cut some gel wax and place in a small, metal sauce pan or any other oven safe container.
3. Put pan/container in the oven and wait until gel wax has completed melted.
4. While waiting for the gel wax to melt, apply painter's tape to the inside of your molds. The painter's tape will make it easier for the lens to be removed from the molds later on.
5. Join the molds together by using binder clips to fasten the ends. Place completed mold on parchment paper.
6. When the gel wax has melted completely, take pan out of the oven and pour wax into the molds.



7. Let cool for 10 minutes.
8. When it looks like the wax has settled, unfasten the clips and gently peel the molds away from the gel. You should be left with a clear lens.



9. Clean up: instead of washing out any leftover wax, let the wax cool in the container and peel wax from container when cooled. Save wax for future use.

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