

Design and printing guidelines

File preparation

Tessellation

Before sending a job to a 3D printer, the model to be printed needs to be tessellated. That means that its geometry needs to be converted into triangles, which are used by the printer to create layers. It is very important to pay attention to this step: if not done correctly, it can cause problems such as inaccuracy or slow processing.

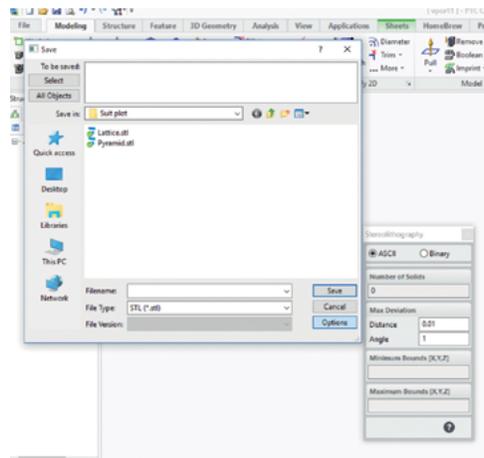
Standard formats in the additive manufacturing industry include 3MF (with more information about the model) and STL.

A normal file size for a model is about 1–30 MB, but the size depends on the type of software that created it, the number of triangles, the number and level of details, and so on.

When exporting to STL in a CAD package, you are often required to introduce some parameters such as angle tolerance and deviation chord height. These parameters define the resolution and file size of the part. The following tips may help you to export with the best surface to file size ratio.

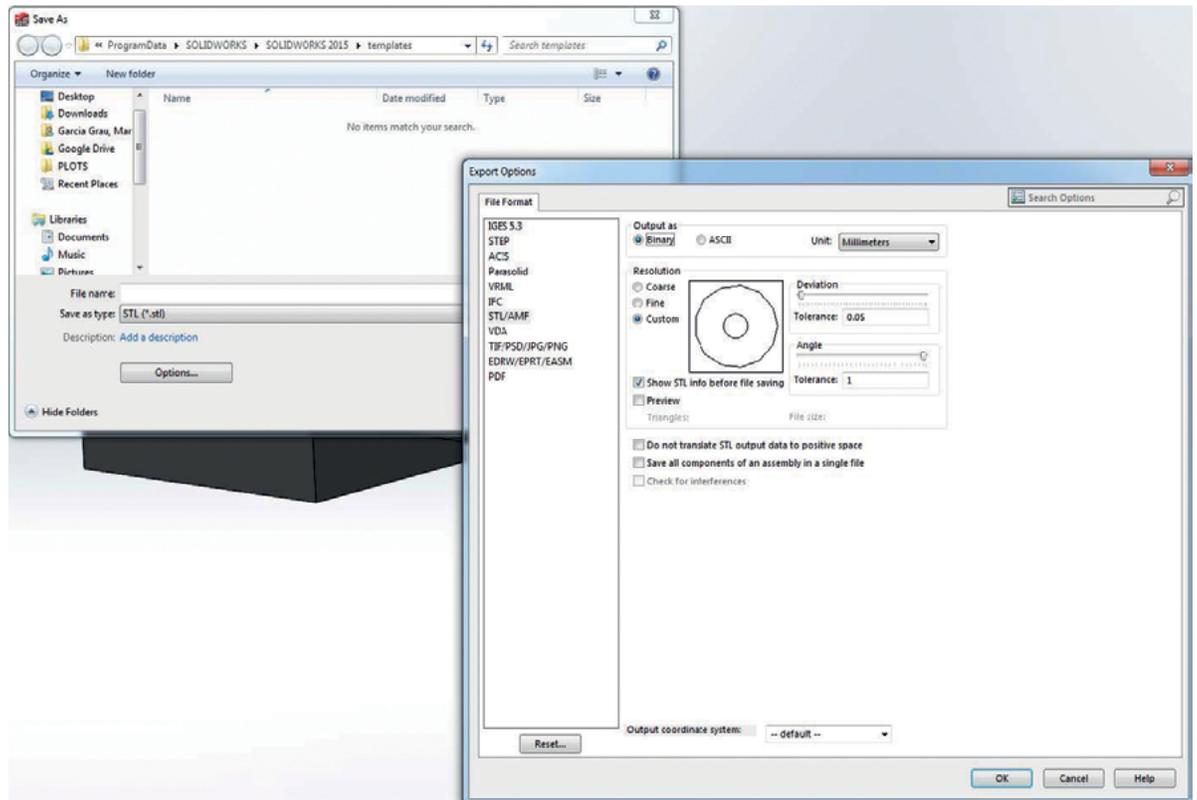
Solid Designer settings

Save as STL, click **Options**, and check the ASCII option. The recommended values for the Distance and Angle box are 0.05 and 1.



SolidWorks settings

1. Click **File > Save As**.
2. Select **STL (*.stl)** as the file type.
3. Click **Options**.
4. Choose the **Binary** option. Binary files are smaller than ASCII files for the same tessellation.
5. Choose **Custom** resolution.
6. Set the deviation tolerance to 0.05 mm.
7. Set the angle tolerance to 1°.



Rhinoceros settings

1. Click **File > Save As**.
2. Select **STL (*.stl)** as the file type.
3. Click **File Name > Save**.
4. Select **Binary**.
5. Select **Detail Controls** from the Mesh Options.
6. Set the maximum angle to 1, the maximum aspect ratio to 6, and the minimum edge length to 0.05.

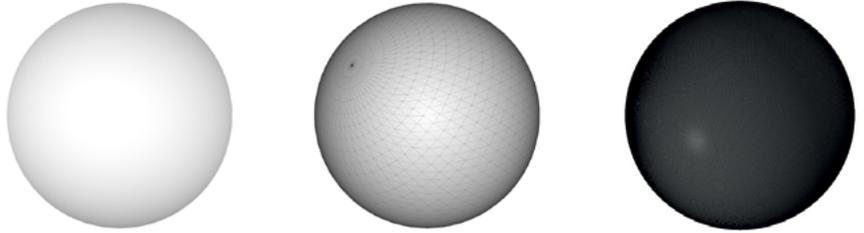
STL problems

- Too many or too few triangles

Too many triangles are difficult to process and, when a certain size is reached, the extra triangles do not provide any further accuracy. For this reason, an excess of triangles could increase processing time for no benefit.

Triangulation of a surface causes faceting of the 3D model. The parameters used to output an STL model affect how much faceting occurs.

Example of tessellation



- Holes in triangles

STL models commonly suffer from surfaces that are not joined to their neighbors, and missing surfaces.

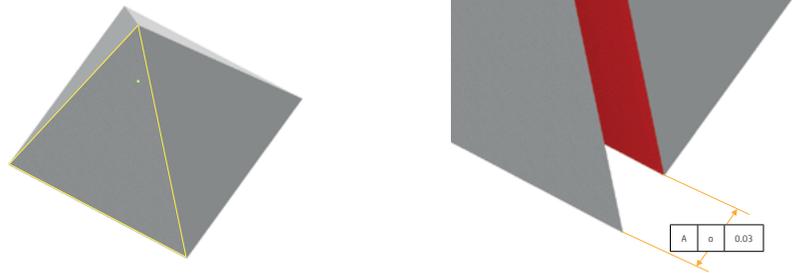
Repairing STL files

STL-repairing software

- Magics – Materialise
- Netfabb
- HP SmartStream 3D Build Manager

Common errors in STL files

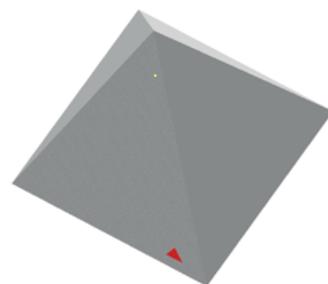
- Triangles not joined



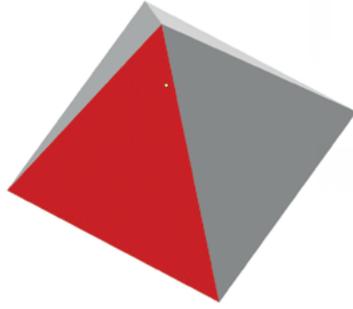
- Overlapping triangles



- Holes in parts



- Flipped-direction triangles



- Tiny shells

