



HOW TO PREPARE A MODEL FOR 3D PRINTING

WITH POLYPROPYLENE (PP) ON THE HP JET FUSION 5210 LINE

Instructions for startups, studios, and producers

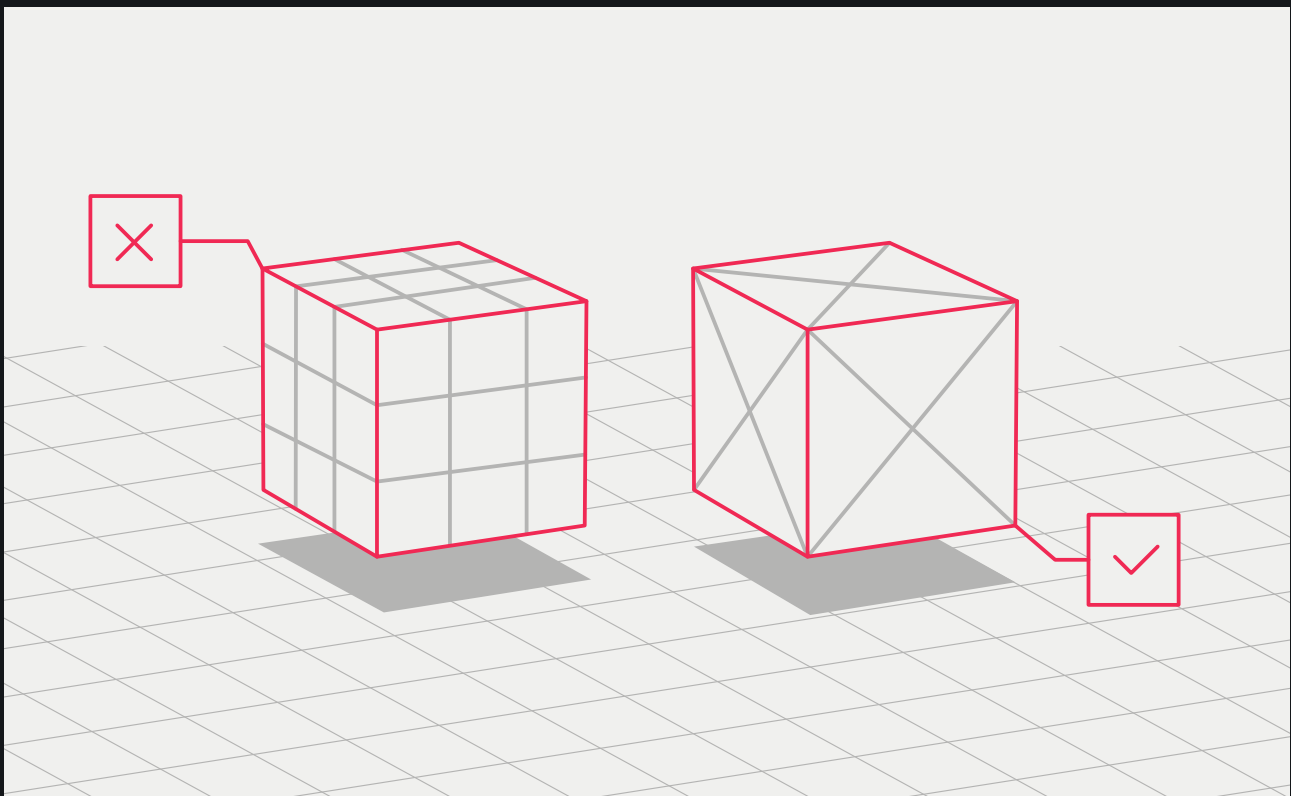
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INTRODUCTION

The correct 3D model is a guarantee that the finished product will meet your requirements. If there are design mistakes, it takes more time to print products, their durability and appearance suffer, and movable parts may be fused into a single piece.

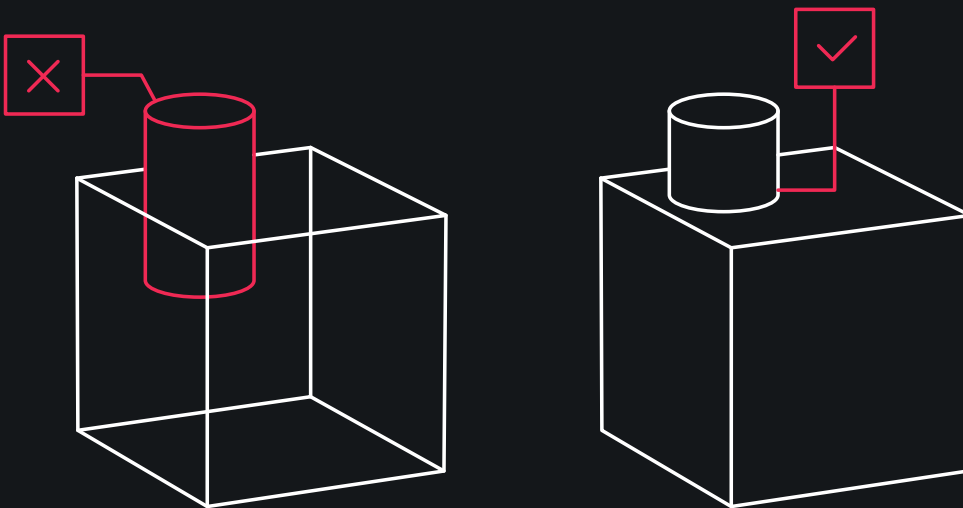
We will cover the basic rules of model design for printing on the HP Jet Fusion 5210 printer.



GENERAL REQUIREMENTS FOR 3D MODELS

Intersection of surfaces

If the product consists of several objects, they should be combined in the model to make sure that the finished part has a continuous external shell. Otherwise, the non-printable surface with an infinitely small wall thickness will appear inside the object.



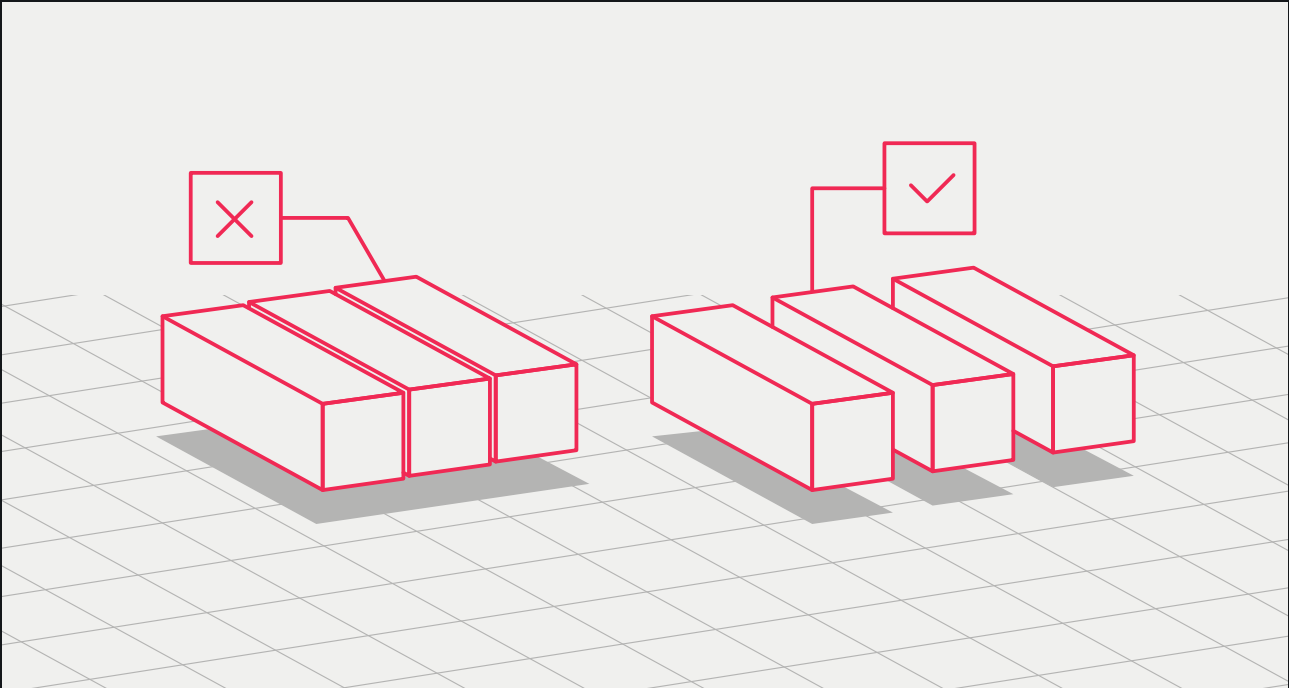
Minimum thickness and angles

Any surface must be **2 mm** mm or more in thickness. The product's durability, including its sharp angles, depends on it. Thin angles of less than **10°** may fail to print or may break during part processing.



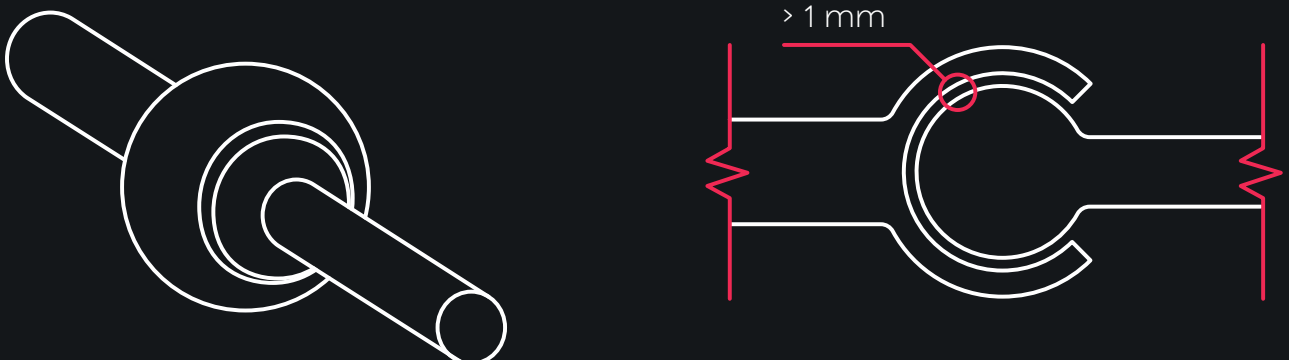
Gaps between parts

When printing products consisting of several parts, ensure that there is a big enough gap between objects, otherwise the polymer powder will fill the gaps and the parts will fuse into a single piece. The minimum allowable gap for printing on the HP Jet Fusion 5210 must be at least **0.4 mm** per size (± 0.2 mm per side).



Movable joints

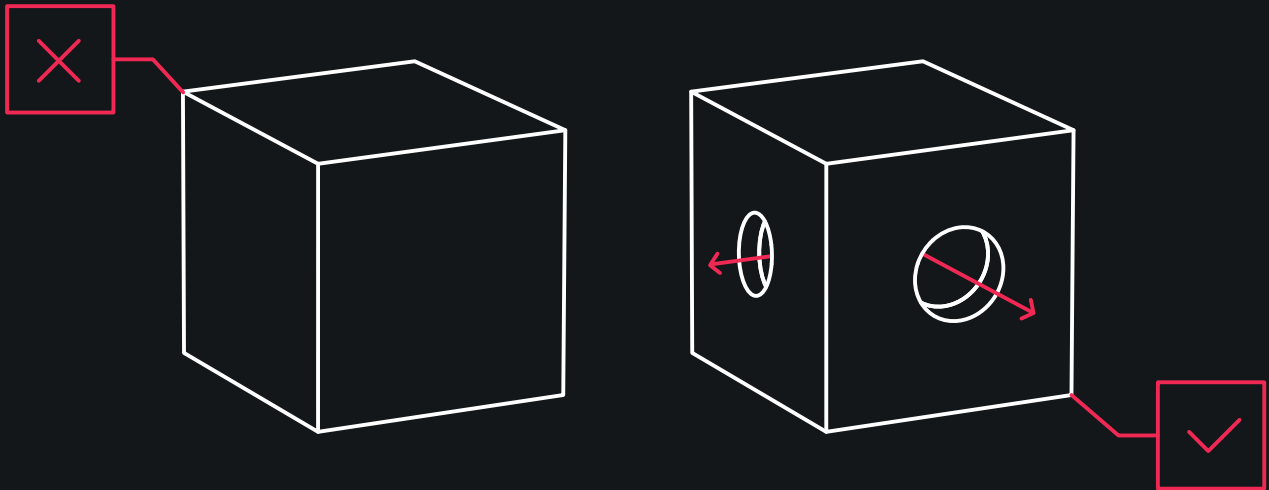
If you print moving joints, the gaps for alignment must be at least **1 mm**. Parts with walls thicker than 50 mm must have a bigger gap in order to ensure proper mobility in accordance with the proportion for each **10 mm + 1 mm**.



Volumetric products

The weight of a part can be reduced by creating a hollow model. It is recommended to leave at least two 10 mm diameter holes per 100 mm² area in order to remove residual material.

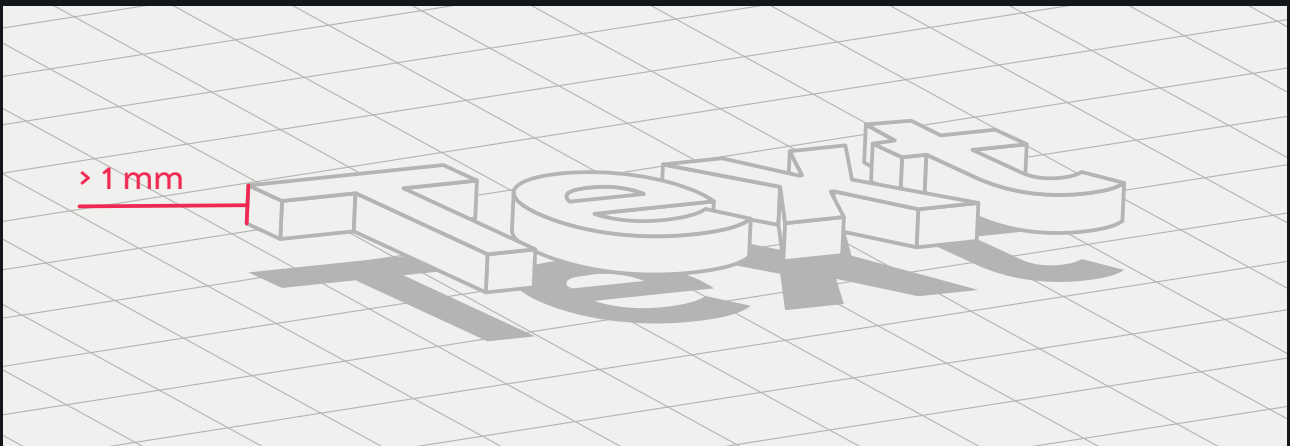
The minimum diameter of holes for printing on HP Jet Fusion 5210 must be **10 mm**.



Text and emboss

Consider the minimum allowable parameters for protrusion or depression. If the sizes are below the minimum, the printer will not be able to recreate them precisely. Keep in mind that sharp edges of the emboss will be removed during the product sandblasting.

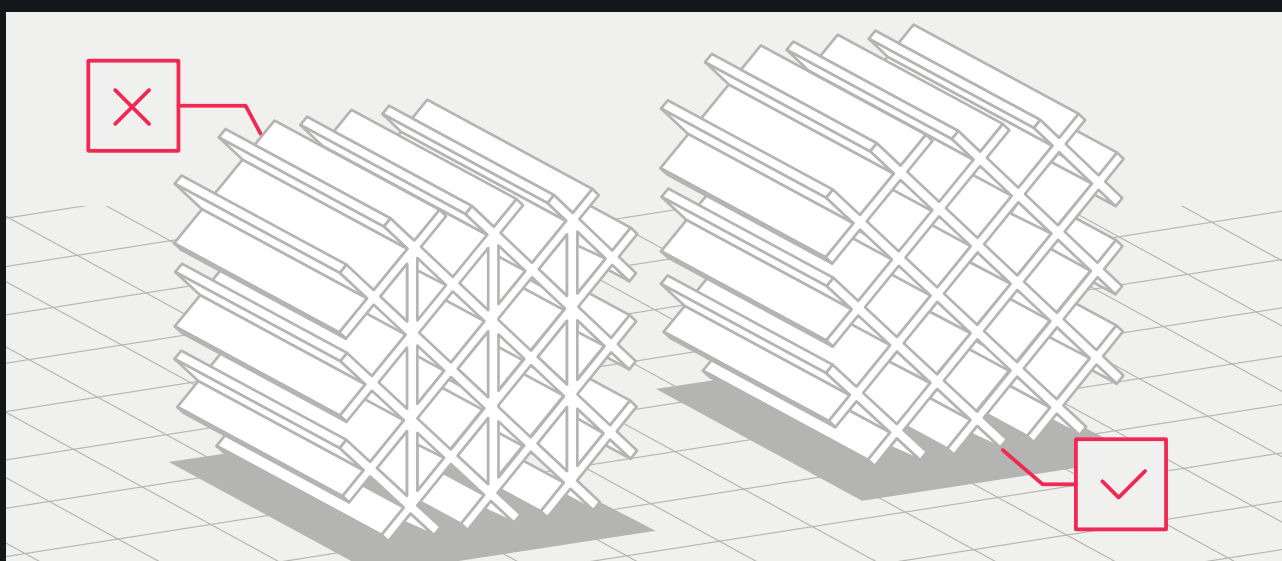
The minimum height of a protrusion or depression for printing a part on the HP Jet Fusion 5210 must be **1 mm**. The text on the part shall be aligned in the XY plane, and the font size must be **9 points** or more.



Grids and solid-state elements

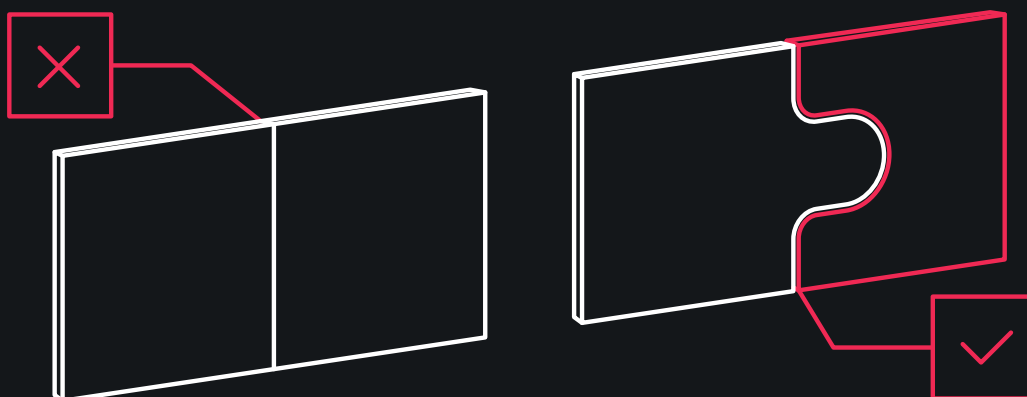
To create solid-state elements and large objects inside cavities, it is recommended to design a grid. This will ensure structure rigidity, reduce the weight of a part and save printing material.

Products with grid elements must be modeled based on the minimum grid spacing. For printing on HP Jet Fusion 5210, this parameter must be at least **0.3 mm**.



Products for gluing and assembling

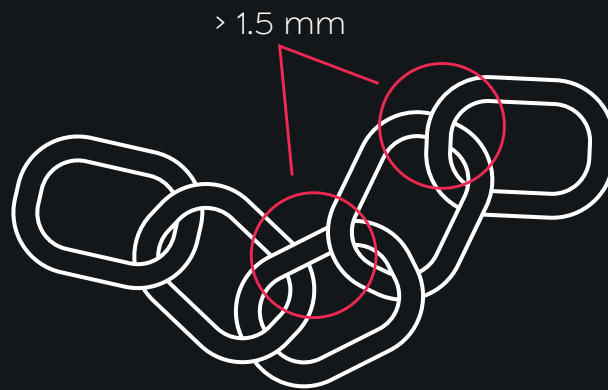
In order to make assembly more productive and to get the correct product size, it is necessary to provide grooves at the joints and consider a gap of at least **0.2–0.3 mm** for the part assembly.



Connected parts and chains

One of the advantages of MJF compared with other technologies is the ability to print interconnected parts, such as chains and chain mails. These elements can vary in geometric shape, but it is important to provide the recommended gap between the links so that one part does not grow together with the other.

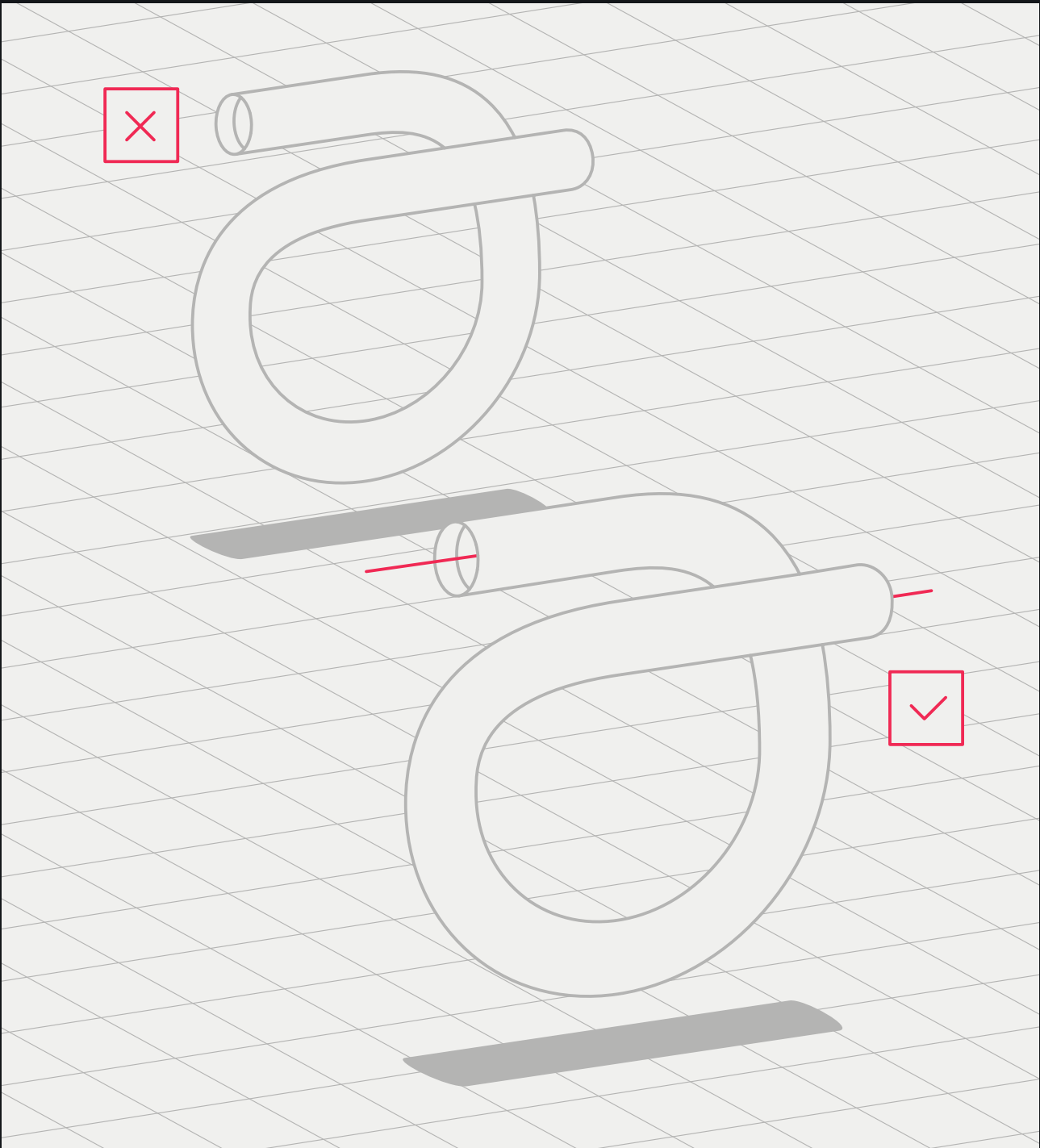
Minimum gap between connected parts (rings): **1.5 mm**.



These types of parts can be printed when folded, for example in a zigzag position. This allows a design to be made longer based on the maximum volume of the print chamber.

Making air-lines and channels

To avoid powder residue in the air-lines, we recommend designing a chain or central vein inside them. The minimum diameter of an air-line or pipe part should be 20 mm. The corresponding minimum chain diameter should be **2-3 mm**. These channels must be kept open, otherwise it won't be possible to remove the powder. The chain can be removed from the part after printing and material removal.



Minimum thicknesses, gaps, and diameters

Part element	Limit
Wall thickness	≥ 0.6 mm
Hole diameter at a wall thickness of 1 mm	≥ 0.6 mm
The protrusion (arm) diameter with a height of 10 mm	≥ 0.6 mm
Gap between the parts with a thickness of 1 mm	≥ 0.6 mm
Font for printing	9 points and more
Gap between walls	≥ 0.6 mm
Protrusion (depression) height	≥ 1 mm
Grid spacing	≥ 0.3 mm

Technology tolerances

Nominal size, mm	1-3	3-6	6-10	10-18	18-30	30-50	50-80	80-120
Standard tolerance values, mm	0.14	0.18	0.22	0.27	0.33	0.39	0.46	0.54

FILE SPECIFICATIONS

File formats

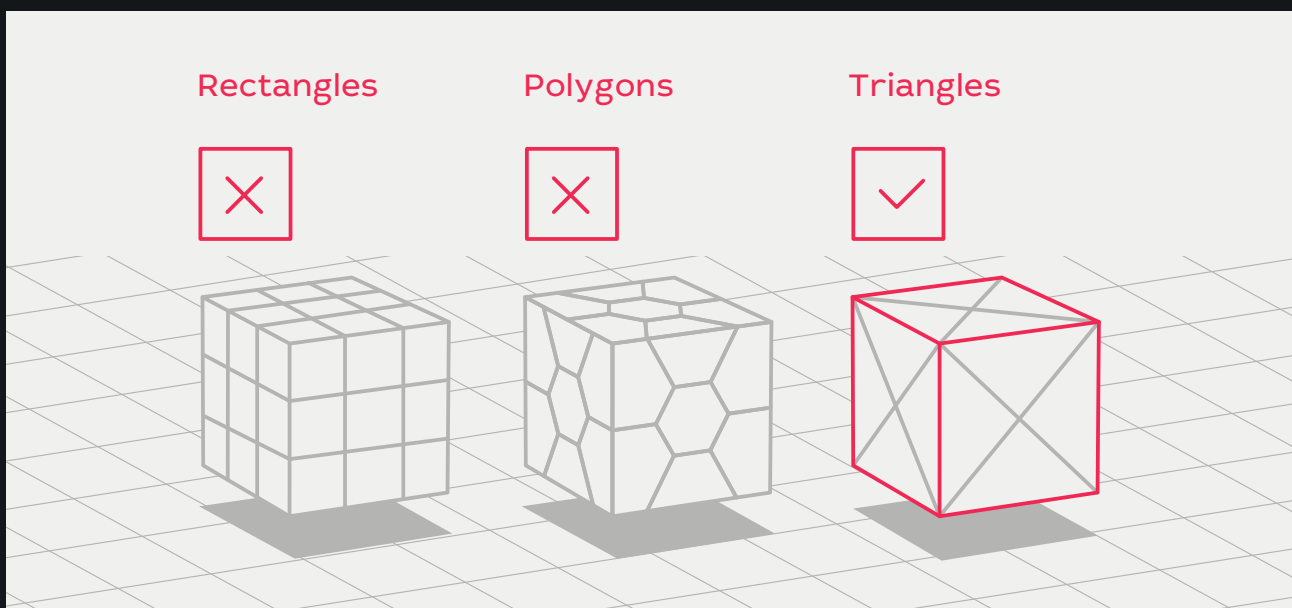
Slicer software (from the word “to slice”) is used to turn a 3D model into the print control code. This software disassembles the model into layers used by the printer for the building of the product. HP Jet Fusion 5210 supports only 3D models in **.stl** format.

File sizes

On average, a model “weighs” **1–25 MB**. The file size depends on the polygon number and the software it was designed in. When exporting into an STL package, additional data is often needed, such as angle tolerance and degree of deviation. These parameters determine the file extension and size.

STL conversion errors

Before sending a job to a 3D printer, you need to create a printing model. The object should consist of triangles used by the printer to create layers. Models with rectangles and polygons are not suitable for printing. The excess detailing of a 3D model increases its processing time, but this is not useful.



Model detailing

The surface triangulation leads to a three-dimensional model facetting. The parameters used for the model output in the **.stl** format affect the facetting degree. For better detailing, CAD system files should be converted to **.3mf**. This format provides the best conversion quality.

When saving models as **.stl** files, click Options and select ASCII encoding. The recommended quality values for the Distance and Angle field are a tolerance of **0.05** and an angle of **1°**. The angle can vary by up to 10° to reduce the file size if you don't mind reduced surface quality or level of detail.

Preparing products with rounded edges for printing

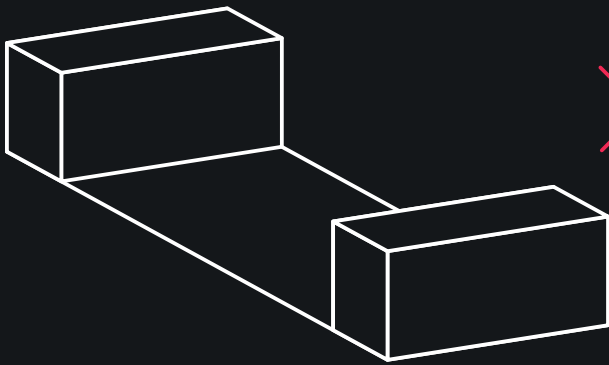
Since products are printed layer by layer, those with rounded edges may have visible lines on their surfaces. To avoid this, we recommend taking the following steps:

1. Mark the model surfaces that require special attention.
2. Provide design documentation for accurate dimensions.

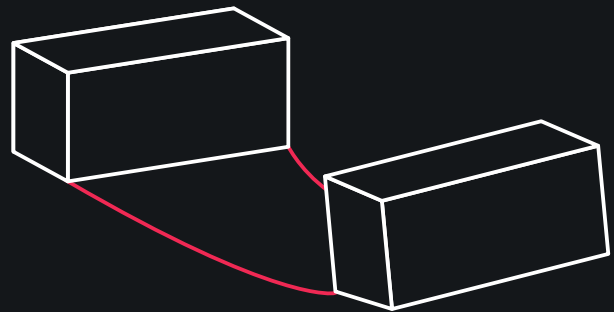
COMMON PROBLEMS

— An incorrect ratio of part sides, wall thickness, and rigidity

Hollow products with thin walls can deform unless an additional support during printing is provided. Therefore, we recommend printing these pieces with a strong internal frame to support the side frames.



View in the layout

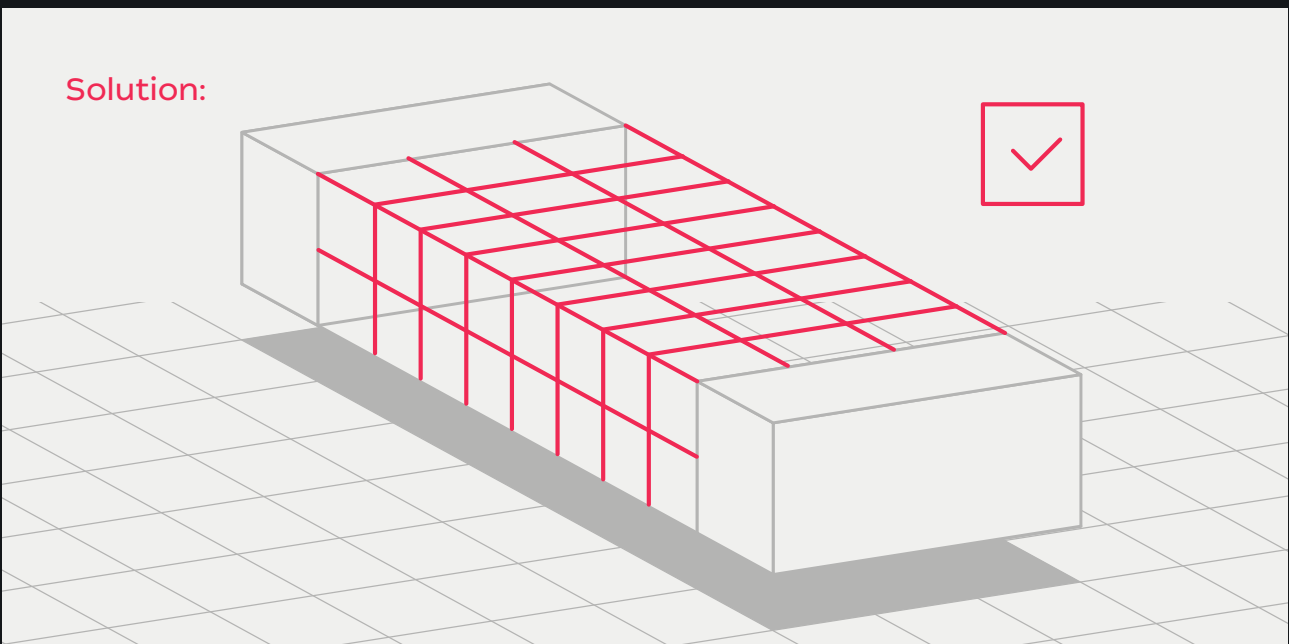


View after printing:

Dimensions: 337 x 63 x 307 mm

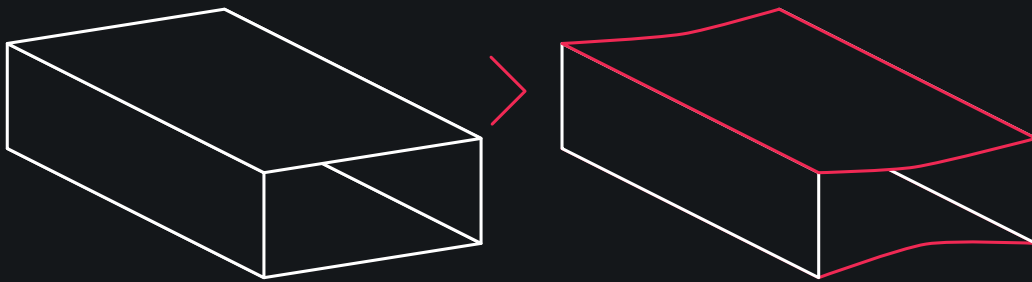
Wall thickness: 2.5 mm

Solution:



Warping of flat parts

Having such wall thickness (**1.2 mm**), the flat parts can warp, resulting in a deformed product. To avoid this, we recommend designing the products with at least **5 mm** wall thickness. Lower values cause the risk of warping.



View in the layout

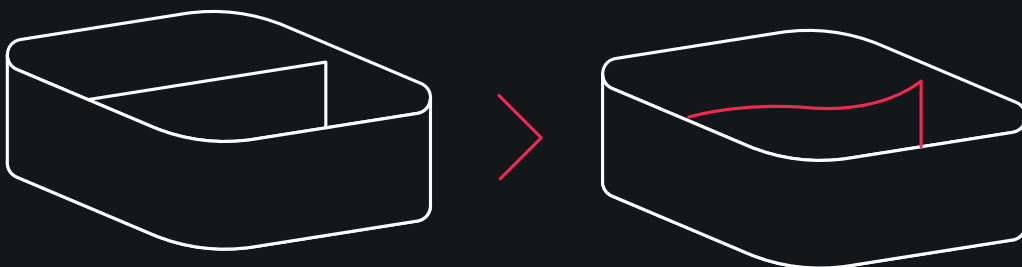
View after printing:

Dimensions: 147 x 222 x 66 mm

Wall thickness: 1.2 mm

Warping of internal partition

Insufficient wall thickness can result in a deformed internal partition. We recommend that you take this possibility into account when creating a 3D model and design internal structures with a wall thickness of at least **0.8 mm**.



View in the layout

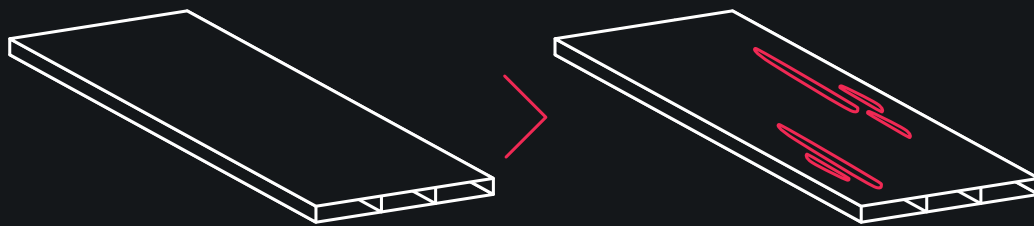
View after printing:

Dimensions: 81 x 80 x 34 mm

Wall thickness: 0.25 mm

— Warping of thin-walled elements due to hot air release

When printing large models with thin walls, the finished product can be deformed, because the hot air being released from an enclosed space may "boil" the part from the inside. To avoid this, we recommend separating large models wherever possible. This will allow the powder to be safely removed during post-processing and the hot air to be properly released during printing.



View in the layout

View after printing:

Dimensions: 155 x 378 x 32 mm

Wall thickness: 1.5 mm



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