

RMS220 Design Guide (PA11) – User Edition

As with all branches of 3D printing (additive manufacturing, AM) technology, the quality of parts produced by selective laser sintering (SLS) is closely linked to the initial design. We have summarized key insights regarding part design and build-nesting (layout) strategies below. Before starting the build, please refer to the following design guidelines to ensure the production of parts that meet your expectations. Should any model features or layout configurations not covered in these guidelines lead to printing issues, please contact our after-sales support team.

Build (Process) Conditions

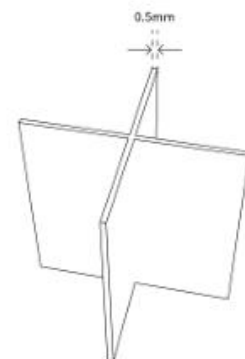
To ensure the build quality of PA11 powder, it is recommended to keep the oxygen content below 2%. Please use an external nitrogen source (purity>99.9%), such as a nitrogen generator or a nitrogen cylinder.

Powder Refresh Ratio (Fresh-Powder Ratio)

Do not use nitrogen gas	Use nitrogen gas
50%	30% (allowing a certain degree of skin dimpling and deformation)

1. Thin Walls

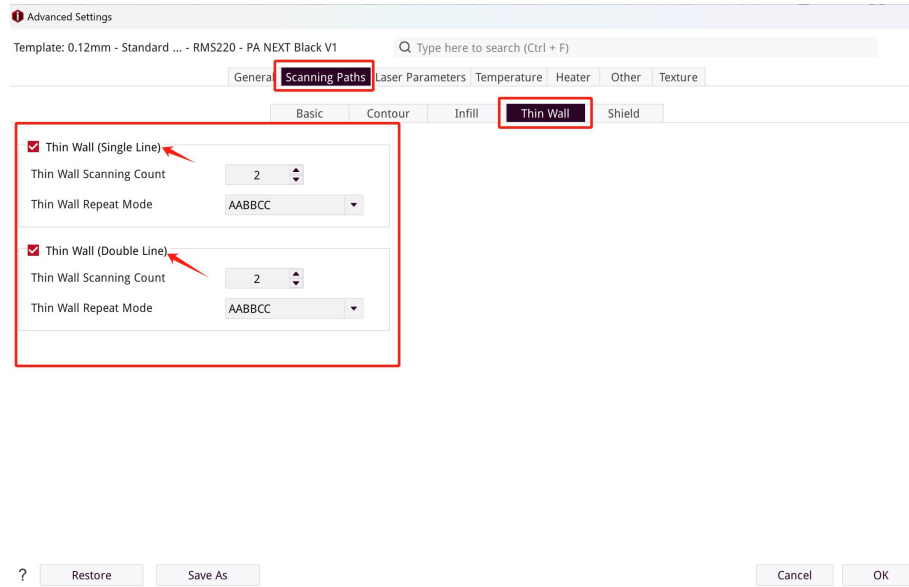
For PA11 material, a greater wall thickness helps form a robust solid surface, whereas a thinner wall enables a certain degree of elastic flexibility. Considering the material's inherent strength and toughness, we recommend a minimum wall thickness of 0.5 mm; if this value is exceeded, the part may easily sustain damage during depowdering (part removal) and post-processing stages, making it difficult to maintain structural integrity.



When configuring thin-wall features in IdeaMaker, it is recommended to place them within the XY plane (as shown in the figure) to achieve more balanced dimensional accuracy and overall performance.

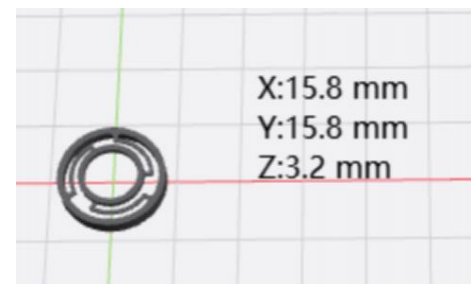
When the wall thickness is less than twice the laser contour compensation (typically for thin-wall parts with a thickness below 0.4 mm), the thin-wall feature should be enabled to prevent thin-wall features from being omitted during laser scanning. Within the standard template, to avoid excessively sharp corners—which can easily result in uneven notches during bead blasting—this feature is disabled by default.





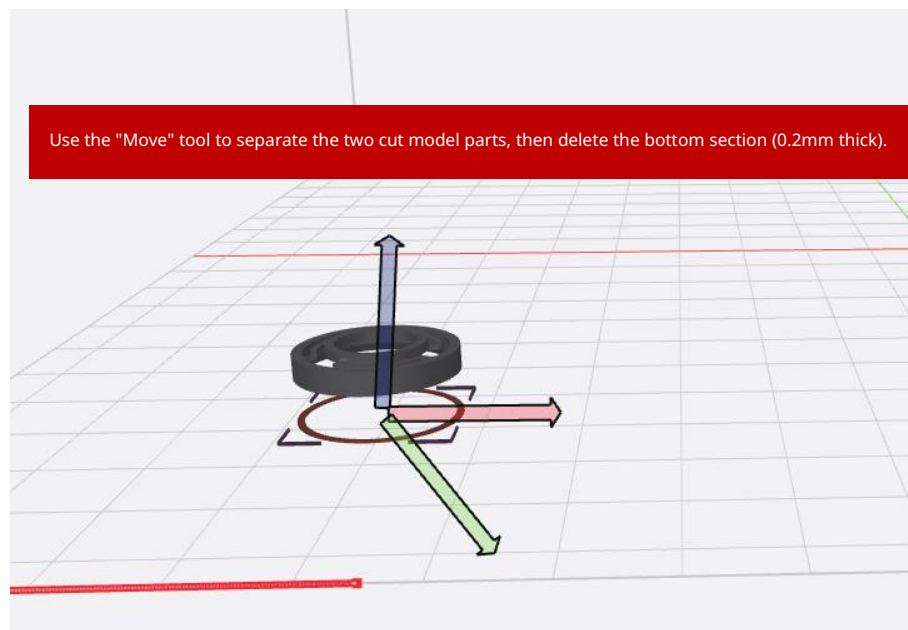
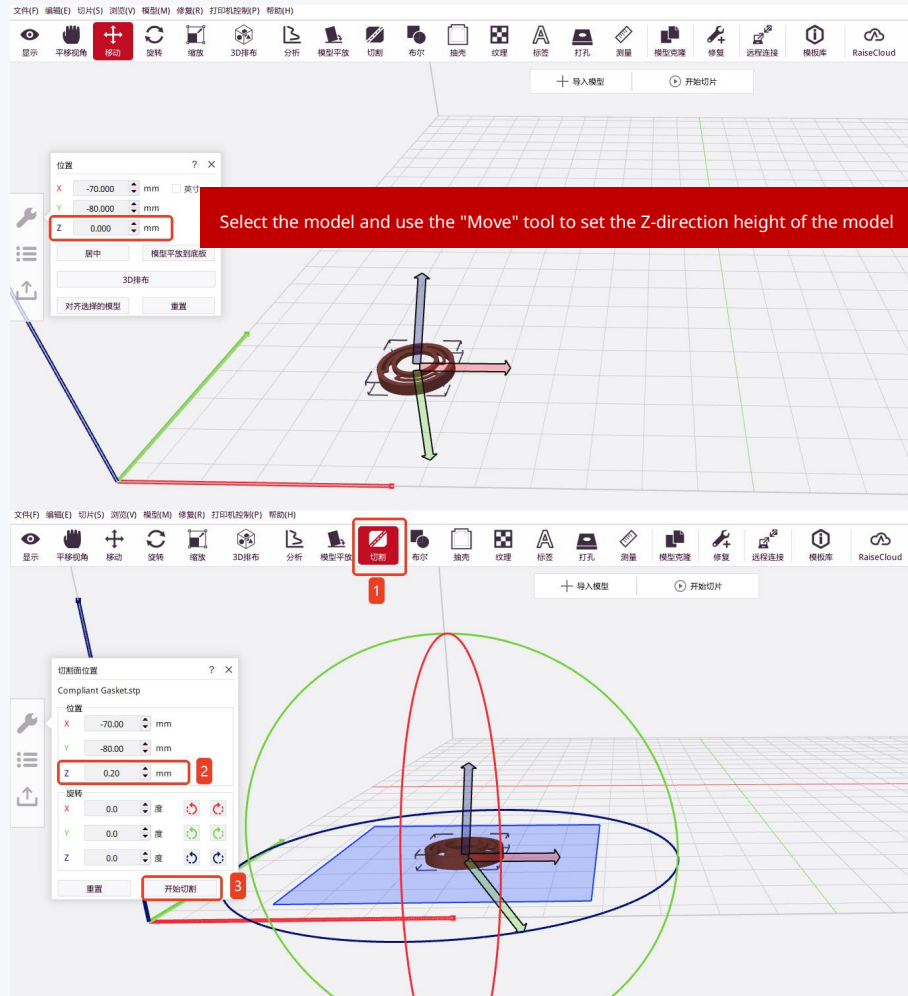
2. Small Thin-Walled Parts

When the model consists of a small thin-walled part (build-direction (Z) height less than 5 mm), as shown in the figure below, the lower base surface of the part is prone to sinkage, which can lead to an increase in the build-direction (Z) height.



A currently effective strategy to address this issue is to cut away approximately 0.2 mm from the lower base surface of the model. This can be achieved using the "Cutting" function in IdeaMaker.



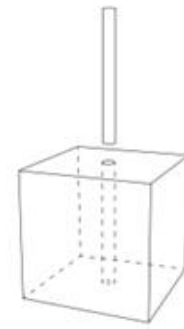


3. Small Holes

The powder inside the holes remains at high temperatures during the printing process, which may lead to hole (pore) contraction or even complete blockage. For PA11 material, we recommend a minimum hole (pore) diameter of 1 mm.

Additionally, for longer straight-through holes, it is advisable to appropriately increase the hole diameter during the design phase; for deeper blind holes or curved internal channels, a further increase in diameter is necessary to ensure effective depowdering (powder removal).

For models featuring such complex hole (porous) structures, please contact our after-sales support team in advance to confirm print feasibility.



When designing pins for mating with holes, particular attention must be paid to the circularity tolerance (i.e., the chordal / tessellation error, the number of edge segments). Excessively large tolerances can cause the circle to approximate a polygon, leading to poor fit between the pin and the hole; conversely, excessively small tolerances can increase the number of corner points along the outer circumference, thereby raising the volumetric energy density, which in turn may result in an undersized hole diameter and oversized cylindrical dimensions.

If the inner diameter of the circular hole is undersized, while the outer diameter and wall thickness remain within normal limits, the inner-contour compensation feature can be enabled.

Inner Outline Subsection Offset

Diameter

3.0

mm

Offset

-0.100

mm

Add

Remove

↺

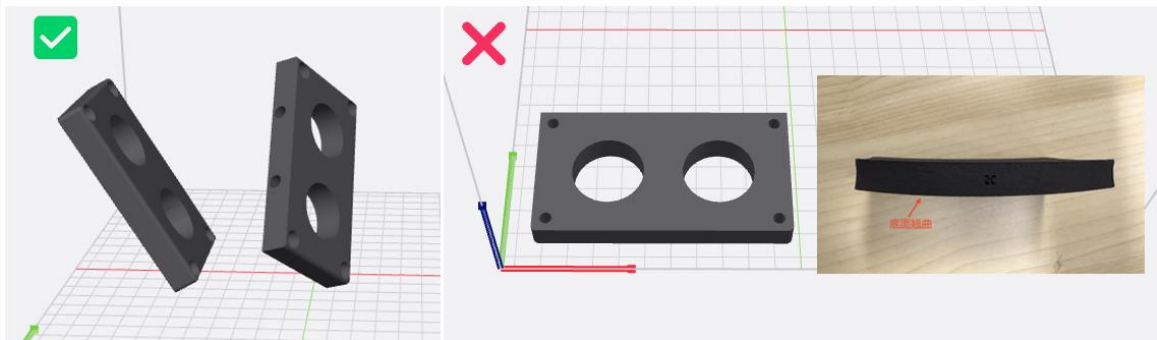
Diameter	Offset
3.0	-0.100

4. Solid / Bulk Parts

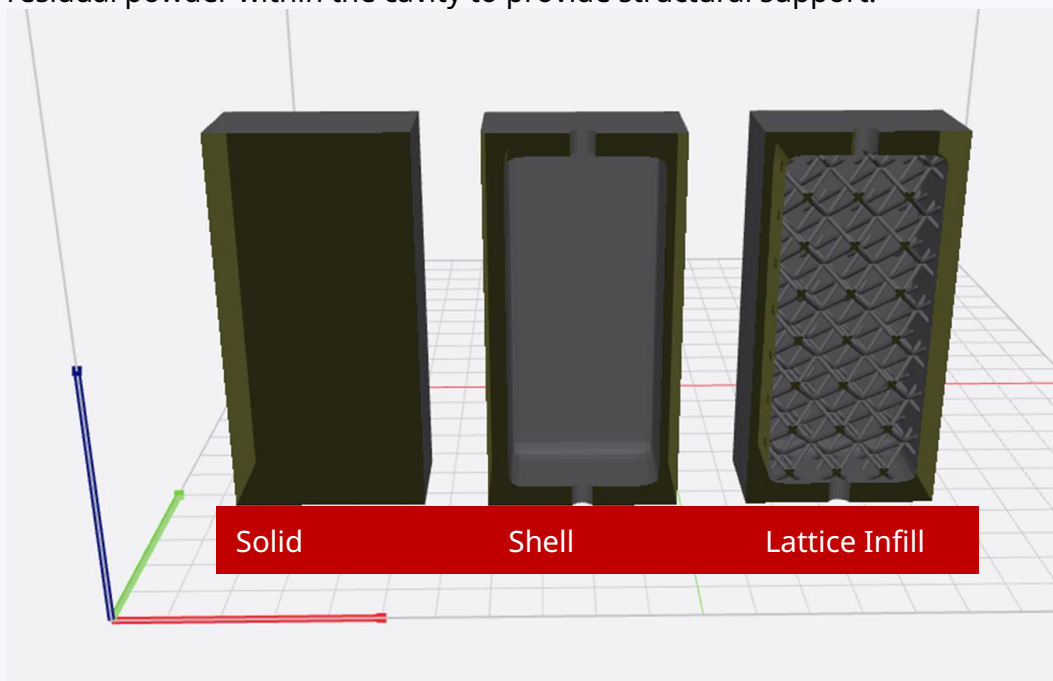
When the model consists of a solid (bulk) part or a large part (where the build-direction (Z) solid height exceeds 10 mm), as shown in the figure below, the bottom surface of the part is prone to warping (curling). The most effective remedy in such cases is to position the part at a build-orientation (tilt) angle of 20° to 70°. Note: when tilting the



part, it should be positioned with its smaller cross-section or angled face resting on the build platform.



For large solid parts with any dimension exceeding 100 mm (i.e., any dimension of the part exceeding 100 mm falls into this category), we recommend employing a shelling (hollowing) design prior to building. This approach can significantly reduce build time, substantially decrease powder consumption, and prevent warpage during cooling and shrinkage. The shell wall thickness is generally recommended to be kept within 5 mm. When components require high rigidity or compressive strength, a fully hollow design may result in insufficient strength. To address this, support structures—such as internal lattices or reinforcing ribs—can be incorporated into the design; this approach enhances overall strength without compromising the accessibility of the internal powder for depowdering. Alternatively, the housing can be fully sealed, leveraging the residual powder within the cavity to provide structural support.



For large shell-type parts without specific strength requirements, powder-removal (cleaning) holes shall be provided on the shell, with a minimum diameter of 5 mm. It is



recommended to drill at least one hole at each end of the longest edge of the part to facilitate air circulation during the bead-blasting process; if the internal structure is complex, the number of holes should be increased. Finally, if the holes need to be sealed after depowdering to preserve the part's aesthetic integrity, the powder-removal holes may be designed as countersinks, and matching plugs may be printed, with sealing achieved through annealing (heat treatment) or solvent (chemical) bonding.

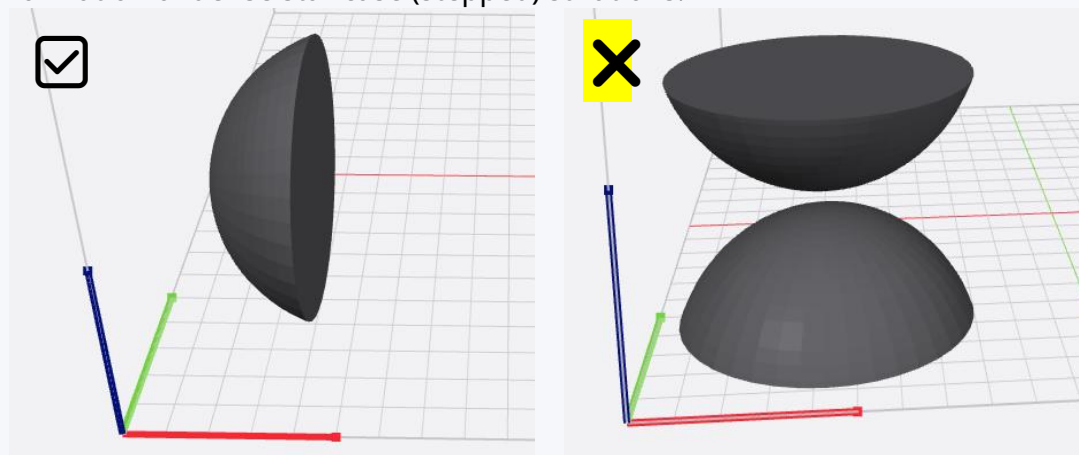
5. Build Nesting (Part Placement)

5.1 Fine Features

For fine features such as small text or surface textures, the order of print clarity from highest to lowest is: top surface > vertical (side) surface > bottom surface > upper overhang > lower overhang. If the feature is located on an inclined surface, it is recommended to maintain an angle greater than 45° relative to the build plane to avoid dense staircase striations.

5.2 Curved (Arc) Surfaces

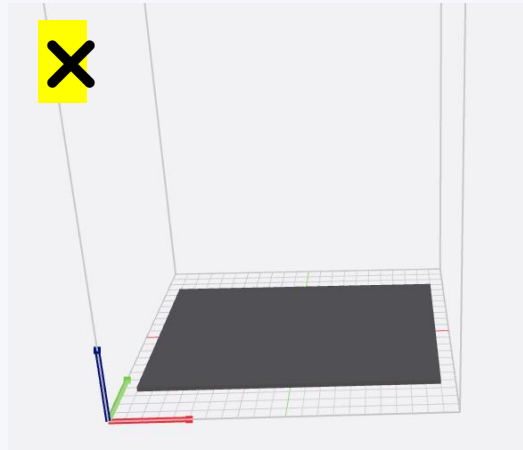
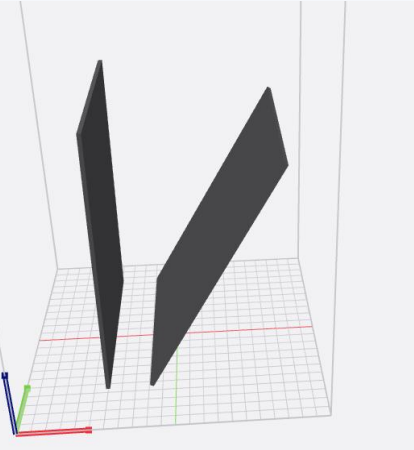
For relatively gentle curved surfaces, orienting the surface sideways can prevent the formation of dense staircase (stepped) striations.



5.3 Large Flat Surfaces (area $\geq 100 \text{ mm} \times 100 \text{ mm}$)

For large flat plates (sheets), it is generally recommended to position them at an angle or vertically; placing a large flat sheet horizontally may cause warping during printing. If a smoother surface finish is desired, it is advisable to position the sheet horizontally at the top of the build platform. For flat sheets with a large specific surface area, significant deformation may occur during cooling and shrinkage; in such cases, additional support can be applied (where "support" refers to the fact that when the sheet is positioned at an angle, more unburned powder provides additional support force) to counteract internal stresses. Alternatively, annealing (heat treatment) can be employed to relieve residual stresses, thereby reducing warpage.



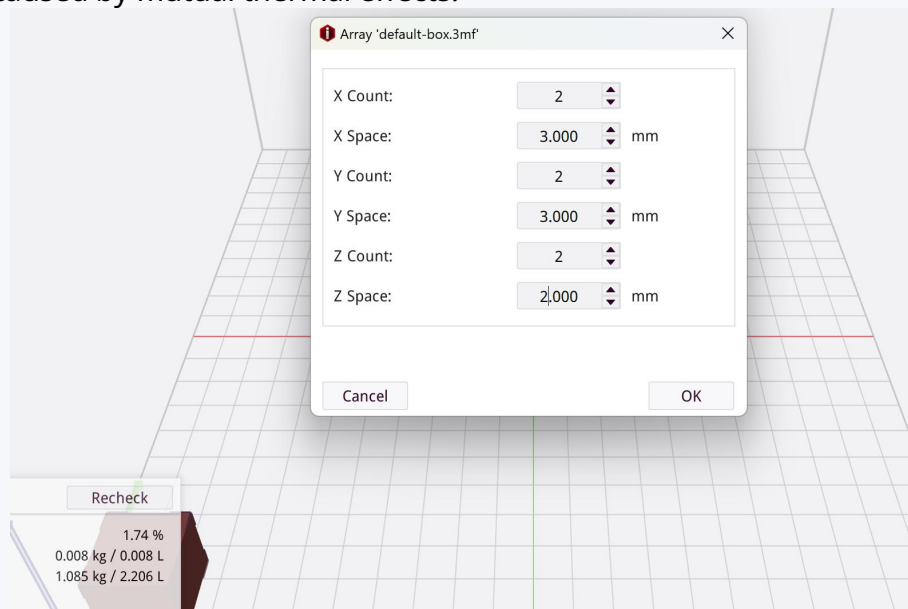


5.4 Assembly

To ensure assembly precision, it is recommended to reserve a minimum fit clearance of 0.3 mm between the assembled parts. When nesting the parts, strive to maintain the same angles for all parts that require fit, thereby avoiding assembly failures caused by variations in angular misalignment.

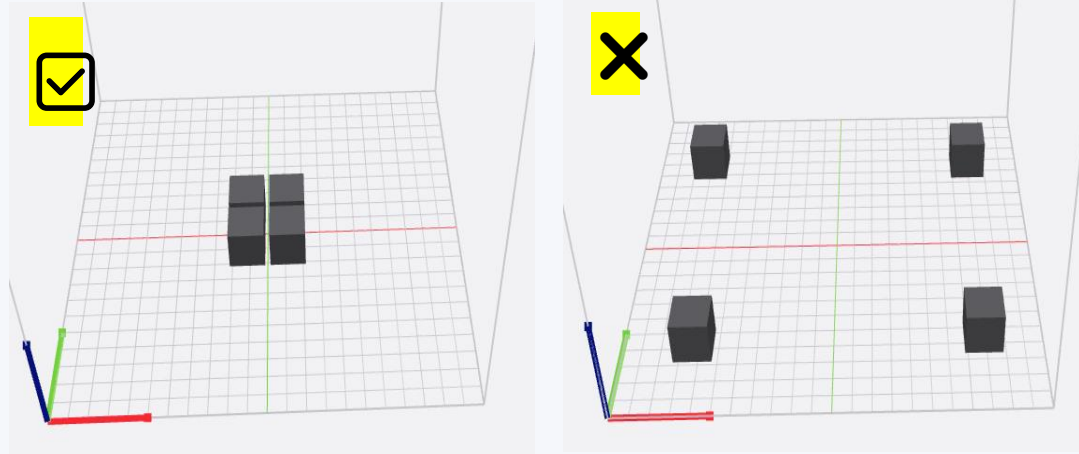
5.5 Part-to-Part Spacing

When employing batch nesting, a minimum spacing of 3 mm should be reserved; for two parallel planes, a larger spacing must be maintained based on their area (for two planes each exceeding 100×100 mm, the spacing should exceed 5 mm) to prevent warpage caused by mutual thermal effects.



5.6 Small-Sized Parts

When arranging small-sized parts (cross-sectional area $\leq 100 \text{ mm}^2$), please position them as centrally as possible; since the bonding strength between the small melt pool and the powder bed is relatively weak, placing them at the edges may lead to adverse effects such as warping or part displacement (pushing).



5.7 Build-Time and Material Savings

When printing non-planar parts, try to place the part flat on the build platform whenever possible, reduce the build height, and shorten both the build time and the powder consumption.

