

How to make a correct printing profile for a castable resin.

This guide aims to explain exhaustively how to create and edit an optimal printing profile for a castable resin. The test downloadable from this folder (named Exposure Test) is composed of various patterns and areas that cannot be read individually but must be evaluated harmoniously and comprehensively to modify the printing parameters accordingly. Each pattern present on the model has been assigned an indicative letter and a characteristic name for easy identification.

Models for generic resins that aim to automatically provide the ideal printing parameters following a single print often cannot be used for castable resins because the patterns and details that need to be printed in jewelry are not common to other applications.

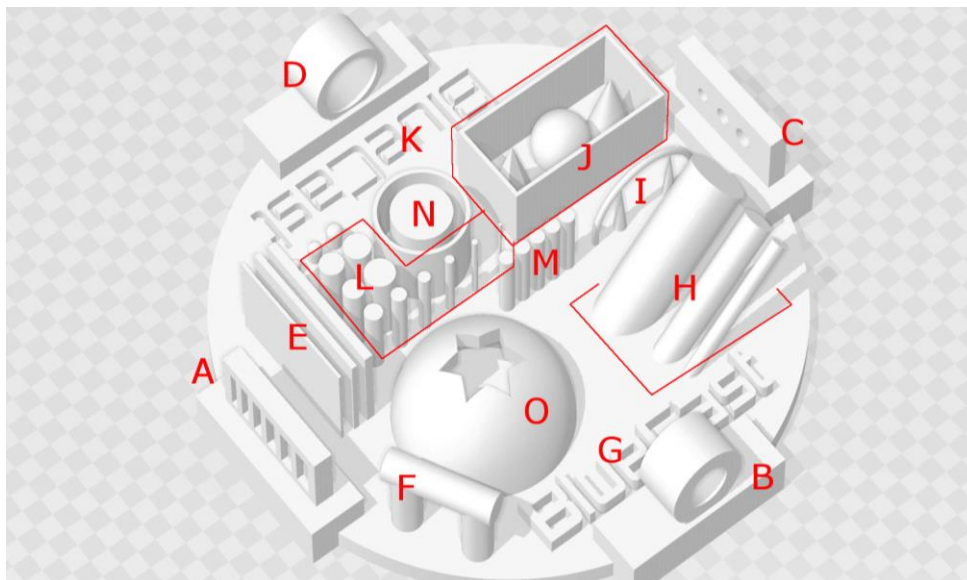
Below is a detailed description of the functions of each area of the model and how to intervene on the printing parameters based on the detected defects.

It is emphasized that this test was developed specifically for jewelry and is based on real forms that occur during the printing of jewelry.

If the model does not adhere to the printing platform, it is advisable in the first phase to verify that the calibration of the Z-axis has been done correctly. If it has, you can increase the exposure time of the bottom layers and reduce the lift and retract speeds of the same. If this is not sufficient, it is recommended to sand the printing platform and make it as planar as possible with 300-grit sandpaper.

It is always recommended to start from a hypothetical printing profile where the estimated exposure times are overexposed. It is recalled that generally, the exposure times of castable resins are longer than those of generic resins.

The test file should be printed flat, directly in contact with the build platform and without supports.



A – VERTICAL STRIPE. This first pattern has the simple purpose of providing a rough indication of the hypothesized exposure times at the first attempt to calibrate the profile of the castable resin. To move from a first investigative phase to a fine-tuning phase, the profile used must be able to make the model adhere correctly to the printing platform, and all the vertical stripes of pattern A must be clearly distinguishable.

B - THE PIPE. The purpose of this pattern is to verify the light penetration in the Z-axis. If the horizontal hole appears closed, extremely ovalized, or deformed, when the vertical stripes of point A are visible, this means that the light penetration in the Z-axis and the light power are generally too high. In this case, you can intervene on the printing parameter "light intensity" (for DLP printers) or "Light PWM" (for LCD printers) by reducing them by 10% each time until a hole that is as circular as possible is obtained. Usually, for all LCD printers, it is never necessary to decrease the light power, and it is sufficient to intervene on the exposure times of the generic layers. For DLP printers, however, this operation is almost always necessary. This area of the model should be read simultaneously with section C - Horizontal Holes.

C - HORIZONTAL HOLES. The purpose of this pattern, which should be evaluated together with pattern B, is to verify the resin bleeding. If the holes appear closed, you can intervene by reducing the exposure time of the generic layers. It is important to consider that if it is not possible to have all the holes open, in addition to reducing the exposure times, it is possible to decrease the light intensity as described for point B. For the holes to be as correct as possible, in the case of a castable resin, it is essential to use a vat film suitable for printing jewelry models.

D - THE HORIZONTAL TUBE. The purpose of this pattern is to verify the ability of the castable resin used to print thin surfaces and whether the vat film is working correctly. If the tube appears not printed correctly or incomplete, it is necessary to immediately replace the vat film with a new one suitable for printing the typical thicknesses of jewelry (PFA 127 microns).

E - THE 3 WALLS. The purpose of this pattern is to verify both the printer resolution and, above all, the correctness of the washing time. All printers and all resins must be able to correctly print the two thicker walls. The third wall, the thinnest one, must be printed but appear very delicate. After washing, it is normal to expect that the thinnest wall may be destroyed, but not the other two. If the washing of the model in alcohol is too long, a flexion and bending of the two larger walls will be noticed. In this case, it is necessary to reduce the washing time.

F - THE BRIDGE. The purpose of this pattern is to verify the resin's ability to self-support and the reciprocal adhesion between the different printing layers. If the space between the columns should "belly" downwards, it means that the layer thickness is too thin to self-support during the different printing phases (lift and retract). In this case, it is

advisable to first decrease the Z-axis speeds, and if this is not sufficient, also decrease the Z resolution (increase the layer height) to have thicker and more robust horizontal layers, so that they do not flex too much. If an acceptable solution is not reached, the vat film is probably too opacified.

G - RAISED WRITING. The purpose of this pattern is to verify if the resin has been heated correctly and sufficiently before printing and in relation to its viscosity. If cracks or holes appear on the vertical surfaces of the letters, this means that the resin is too dense and cannot distribute correctly during the retract phase (movement of the platform towards the bottom of the vat). It is therefore advisable to heat the castable resin more or decrease the retract speeds.

H - THE INCLINED COLUMNS. The purpose of this pattern is to verify if the Z-axis speeds are compatible with the characteristics of the chosen castable resin. If slippage of the columns in XY is evident, the first thing to do is decrease the Z-axis speeds and increase the waiting times between the various printing phases.

I - THE ARCH. It is normal for this part to be very fragile. The purpose of this geometry is to verify that the exposure times are correct in relation to the light intensity. The cone-shaped columns should only touch the arch, and the section of the arch in the upper quadrant should be as circular as possible (equal horizontal and vertical diameters). This part of the model is very difficult to read and can also be ignored during the parameter calibration phase for castable resins.

J - THE FENCE. The purpose of the fence is to verify if the rest time after retract / wait before print and rest time after retract are adequate. If the fence appears delaminated, it is good practice to increase these waiting times to allow the resin to resume a correct geometry at the end of each movement. The solids inside the fence, on the other hand, have the function of indicating if the anti-aliasing level is too high. The pyramid must be distinguishable from the cone, and its edges clearly legible. If the pyramid is not distinguishable from the cone, it is advisable to decrease the Anti-aliasing level or deactivate any blur option.

K - ENGRAVED WRITING. The engraved writing has the purpose of verifying overexposure phenomena and, at the same time, of verifying if the castable resin has been heated adequately before printing to decrease its viscosity (same function as pattern G). The first thing to do is to verify if the pattern of point C has been printed correctly. If yes, but the writing still appears occluded, it is advisable to heat the resin more to allow it to escape from the engravings during the retract phase. A cold resin usually generates cracks on the edges of the letters.

L - THE SET OF COLUMNS. All the columns of this pattern must be printed (it is normal for the smallest one to appear flexible, deformed, or collapsed on itself immediately after printing). The purpose of this pattern is to confirm if the exposure of the generic layers

found with the analysis of the other points is correct in relation to the diameter/height ratio of the columns to simulate the ability of the castable resin to print supports correctly. If the columns appear very fragile and vitrified, it is a symptom of overexposure, and it is advisable to decrease the exposure times.

M - THE TWIN COLUMNS. The purpose of this pattern is to verify the exposure times of the generic layers. If the columns appear attached to each other, it is necessary to intervene by decreasing the exposure times of the generic layers. If the exposure times have been shortened to the point that the model is no longer generally printable, you can intervene on the "tolerance compensation beta" found in the advanced tab of the Chitubox settings by entering negative values.

N - THE VERTICAL CYLINDERS. If all the parameters are correct, the resin has been heated correctly, and the model has been washed adequately, it is expected that the two parts will be printed correctly and will be solid, without any accumulation of resin inside the cavity.

O - THE DOME. The purpose of this pattern is to verify the Z resolution of the slicing file and the level of the Anti-aliasing parameter in relation to how smooth the surfaces appear. Near the apex of the sphere, steps may be visible, or along the vertical section, the pixels of the projector or LCD screen may be recognizable. In the first case, it is advisable to increase the slicing resolution (decrease the layer thickness). In the second, to increase the Anti-aliasing level.

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