



Processing Guide

Dental 3000 VP Light Tan

Material for dental models

ALTANA Cubic Ink materials for the dental sector without body contact, for example, for the production of models for the thermoforming of aligners, are characterized by high-resolution and hollow object-printing with high detail sharpness and dimensional accuracy on all common DLP and LCD machines.

Fine-tuned thermo-mechanical properties and a good scratch resistance allow for a robust post-treatment and further processing via temperature and pressure. The color of the material can be adjusted to the customer's specifications.



Materials can be used in



Dental

Performance Indicators

Price and Processability	Very Good
Material Thickness for Hollow Structures	>3 mm
Thermoforming	Up to 220 °C
Flexural Strength	83 MPa

Preparation

Printing

Washing

Post-Curing



LCD, DLP, mSLA

2 - 5 min Cleaner 400 or IPA

Cure with UV

Preparation

Safety Guideline

Dental 3000 VP Light Tan is a chemical formulation in the liquid state and has to be treated as such until it is fully cured. Please use personal lab protection equipment such as appropriate gloves, goggles and lab coat. Wash contaminated body parts and equipment directly after occurrence and change contaminated gloves immediately. Do not consume the resin.

Danger



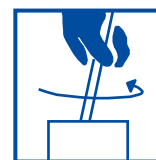
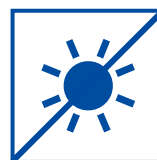
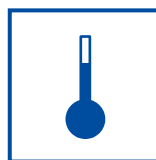
The information given in this document do not constitute a legally binding SDS, which will be provided at purchase.

Storage and Preparation

Please make sure the resin is stored at room temperature.

Please make sure the resin is not exposed to light.

Please stir resin thoroughly prior to use.



Printing

Print Settings

Dental 3000 VP Light Tan printed part properties may vary with printer, print settings, object orientation, part geometry and post-processing. The shown recommendations of printer and print settings are based on Cubic Ink's experiments and experience and do not include all possible processes and feasibility of the material (Table 1 - 3). The processor is welcome to explore the workflow regarding printer and print settings since Dental 3000 VP Light Tan is compatible with a broad range of LCD, DLP and mSLA machines. Nevertheless, Cubic Ink supports and customizes the processing guidelines together with their partners. If not stated otherwise specimens and objects are printed vertically.

Printing

General Curing Parameters

In Table 1 different curing characteristics are presented. The necessary critical energy as well as the penetration of depth indicate the reactivity and curing in depth abilities of the liquid resin.

Table 1: Curing Parameters measured at Cubic Ink for Dental 3000 VP Light Tan.

Measurement	Light Tan	
<u>405 nm, 8 mW/cm²:</u>		
E _c [mJ/cm ²]	4.07	
D _p [mm]	0.19	
Thickness after 1 s of exposure [mm]	0.13	
Thickness after 5 s of exposure [mm]	0.45	
<u>385 nm, 11 mW/cm²:</u>		
E _c [mJ/cm ²]	5.09	
D _p [mm]	0.13	
Thickness after 1 s of exposure [mm]	0.10	
Thickness after 5 s of exposure [mm]	0.31	
x-y-Compensation [%]	1.4 ¹	1.0 ²
z-Compensation [mm]	<0.01 ¹	<0.01 ²
Printable overhangs [°]	up to 25 ¹	up to 20 ²
Minimal wall thickness unsupported [mm]	0.4 ¹	0.4 ²
Minimal wall thickness supported [mm]	0.6 ¹	0.2 ²
Minimum pin thickness [mm]	0.5 ¹	0.5 ²
Minimum hole thickness vertical [mm]	0.5 ¹	1.0 ²
Minimum hole thickness horizontal [mm]	1.0 ¹	1.0 ²

¹Measured with samples printed and cured via Asiga Pro 4K (DLP 385 nm, 11 mW/cm², 100 µm) and 2x 30min Prusa CW1S; ²Measured with samples printed and cured via Formlabs Form 4 (LCD 405 nm, 11 mW/cm², 100 µm) and 2x 30 min Prusa CW1S.

Printing

Print Settings

Table 2: Suggested curing times depending on wavelength, color, printing thickness and intensity of light source for Dental 3000 VP Light Tan.

Wavelength	Color	Layer thickness [μm]	11 mW/cm ²	8 mW/cm ²	5 mW/cm ²	2 mW/cm ²
385 nm	Light Tan	50	0.8 s	1.2 s	1.9 s	4.6 s
		100	1.1 s	1.5 s	2.5 s	6.2 s
405 nm	Light Tan	50	-	0.7 s	1.2 s	3.0 s
		100	-	1.0 s	1.5 s	3.8 s

Dental 3000 VP Light Tan was tested on several printers such as

Prusa SL1S Speed (LCD, 405 nm, 2 mW/cm²), Phrozen 8K Mighty (LCD, 405 nm, 2 mW/cm²), Phrozen 8K Mega S (LCD, 405 nm, 3 – 5.6 mW/cm²), Asiga Pro 4K80/ Max 2 (DLP, 385 nm, 2 - 11 mW/cm²), Formlabs Form 4 (LCD, 405 nm, 2 - 11 mW/cm²). For more information, please contact us.

Table 3: Examples of print settings at Cubic Ink for Dental 3000 VP in Light Tan.

Printing system	Color	Layer thickness [μm]	Exposure time bottom layer [s]	Exposure time default layer [s]
Prusa SL1S Speed	Light Tan	50	10.0	4.0
(LCD, 405 nm, 2 mW/cm ²)	Light Tan	100	10.0	5.0
Formlabs Form 4	Light Tan	100	2.3	0.7
(LCD, 405 nm, 11 mW/cm ²)				
Asiga Pro 4K80	Light Tan	100	7.9	1.1
(DLP, 385 nm, 11 mW/cm ²)				

Washing

Removing & Washing

- Washing with [Cubic Ink Cleaner 400](#) or isopropyl alcohol (IPA) up to 5 min
- Ultrasonic bath or adequate mixing equipment is beneficial

Cleaning

- Treatment with compressed air optional

Drying

- Let dry at ambient conditions for at least 30 min.
- Drying time is significantly increasing if objects are washed prolonged than recommended. Otherwise cracking can occur.

Post-Curing

Dental 3000 VP Ligh Tan needs to be post-cured to reach its final material properties. The post-cure used on the TDS (Version 2) contained 2 x 2000 flashes via NK Optik Otoflash G171-6 (350 – 550 nm). Other examples of post-curing are shown in Table 4 to emphasize different effects of UV-curing chambers, wavelengths, intensities, time and additional thermal post-cure.

Dental 3000 VP Light Tan is post-cured via

- UV-cure is necessary
- Temperature in UV-chamber as high as possible (≥ 80 °C) is beneficial
- If possible, use vacuum or nitrogen atmosphere

Table 4: UV post-processing carried out at Cubic Ink for Dental 3000 VP Light Tan (printed with 100 μ m).

Post-Process	E-Modulus [GPa]	Tensile strength [MPa]	Elongation at break [%]	HDT B [°C]
2 x 30 min Formcure L, 80 °C	3.1	64	5.1	83
2 x 5 min Formcure 2nd, 100 °C	3.1	65	4.6	88
2 x 2000 flashes Otoflash, N₂	2.5	51	7.0	70
2 x 30 min 3D Systems, 60 °C	3.1	63	5.2	75
2 x 30 min Prusa	3.0	59	5.8	61
30 min RSCure, vac.	3.1	60	4.9	66
60 min Asiga Cure, 80 °C	3.2	65	4.0	81

Formlabs Formcure L = LED 375, 405 nm; Formlabs Formcure 2nd Gen= LED, 405 nm; NK Optik Otoflash G171-6 = light-flashes, 350 – 550 nm, N₂; 3D Systems LC-3D post-process unit = 350-550 nm; Prusa CW1S = LED 405 nm; Rapidshape RSCure = upper + lower wavelength, 170%; Asiga Cure 1.5 L = LED, vacuum, UV and temperature simultaneously. Tensile testing DIN EN ISO 527-1 5A-specimens, 5 mm/min, 23 °C; HDT B DIN EN ISO 75, all specimens printed vertically.

Post-Curing

General Effects of Post-Curing

- Washing and drying:
 - The washing fluid and time of washing can influence the final material properties.
 - In some cases (e.g. using higher temperatures while post-curing) cracks can occur if not washed as recommended and not dried thoroughly.
- UV-Post-cure:
 - Higher wavelength (e.g. ≥ 405 nm) better for cure in depth, shorter wavelength (e.g. ≤ 365 nm) better for surface cure.
 - Broad spectra light sources or the combination of multiple wavelengths improve the overall curing process.
 - The higher the intensity of a light source, the shorter the time in the curing chamber.
 - Part orientation in the chosen UV-chamber is crucial. Most chambers focus the LED-spots in the middle of the volume. Placing flat objects on the bottom may cause nearly no or less irradiation by light. Curing time may need to be adjusted depending on the geometry of the part.
- UV Post-cure with vacuum or nitrogen atmosphere:
 - Better for surface cure. Decrease of time in UV-chamber.
 - Less stickiness.
- UV-Post-Cure with simultaneously temperatures above 60 °C:
 - Good for cure in depth and surface cure. Decrease of time in UV-chamber.
 - Not that much depending on the color and geometry of the part, the effect of temperature influences the homogeneity of curing.
- Additional thermal post-cure after finished UV-cure:
 - Good for final cure in depth and surface cure.
 - Recommended temperature varies between 80 - 130 °C for 1 – 5 hours for most materials, between 130 - 190 °C for 0,5 – 5 hours for very high temperature resistant materials.

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