Technical Data Sheet

3D Business S.r.l.
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3DB-COMPACT GUIDE

(TDS) TECHNICAL DATA SHEET

UV Resin 3D Printers LCD/FEP

General Description:

UV resin is a photopolymer that is sensitive to UV light sources, specifically those with a display (LCD) utilizing 405nm LEDs and a fluoropolymer (FEP) vat release layer. Photopolymers consist of light-reactive acrylic and/or methacrylic resins that initiate a curing reaction upon exposure to UV light. This product is designed to optimize performance during the printing process on low-power LED 3D printers.

CHARACTERISTICS

Engineered to provide a UV resin for the meticulous production of surgical guides, characterized by stability and a high release capacity from FEP. Following suitable post-treatments, including cleaning, UV finishing to achieve normalized surface hardening, and sterilization, the object is prepared for application in clinical studies.

KEYFACTORS

- Precision in detail reproduction.
- Elevated dimensional stability
- Minimum withdrawal amount
- Smooth surface of the completed model
- Concise curing process

APPLICATIONS

Engineered for the fabrication of dental surgical guides, utilized for the planning and accurate placement of dental implants; crafted to be biocompatible and sterilizable.

Printing Preparation and Precautions:

- **Safety Devices PPE:** utilize dust-free nitrile gloves (which offer greater protection than latex gloves), wear protective clothing that covers exposed skin (such as lab coats), and employ UV protection glasses (to shield the eyes from harmful light sources).
- **Work Area Preparation:** Prepare the work surface for cleaning with solvents, ensure proper ventilation in the work area, and minimize direct light in the printing area, such as from nearby windows. Utilize warm lighting for ambient illumination, specifically with a wavelength distant from UV at 405nm.
- **Printer Preparation:** Refer to the manuals and guides provided by your 3D printer. Diligently adhere to the manufacturer's instructions to prevent voiding the warranty, and verify the following points:
  - Execute all necessary updates for print management software, clients, drivers, or firmware.
  - Assess the condition of all components subject to wear and replace any that are deteriorated.
  - Verify that the lubrication of the mechanical components is optimal in accordance with the manufacturer's guidelines.
  - Meticulously clean all surfaces (transmissive or reflective) between the resin in the tank and the UV source.
  - Inspect the tray film for any signs of deterioration or halos, and replace the consumable as necessary.
- **Tray Preparation and Release Agent Condition:** Ensure that the FEP film is not excessively worn, as this may compromise the quality of printing. Inspect for stains, lines, and signs of degradation, and replace the film if it shows wear. Any surface roughness on the film will be accurately transferred onto the printing of smooth and flat objects, resulting in noticeable errors, which would similarly affect any resin with defined characteristics. Clean the tray with alcohol to eliminate any residues from previously used resins, and filter the resin prior to printing to prevent solid residues that could lead to defects, inclusions, or even damage to the FEP, jeopardizing the printer and resulting in print failures.
- **Printing Temperature:** Prior to printing, ensure the resin is heated to a temperature ranging from 25°C to 30°C. Liquid photopolymers experience a chemical solidification reaction that is influenced by environmental factors such as humidity, reaction temperature, and contaminants. Deviating from the specified temperature range during the printing process may result in defects or complete failure of the print.
- **Optimal Mixing:** Employ a resin mixing system or, alternatively, shake the resin vigorously in its original container for a minimum of 5 minutes. Properly mixed resin should exhibit uniformity without sedimentation, color variations, or discrepancies in opacity. Inadequate mixing or partial mixing may result in defects in the print or complete failure.
- **Avoid Contamination:** Refrain from mixing the resin with any other products, including other resins or residues from previously utilized resins. Steer clear of combining it with liquid and solid contaminants that may result in print failures. Additionally, be mindful of contaminants specific to UV resins: water, humidity, solvents, alcohol, expired resins, different types of resin, resins from varying production lots, and resins that have been exposed to air for over a week or to sunlight.
- **Refilling the Tray:** Pour the pre-mixed resin into the tray, gently mix the resin with a silicone spatula, and ensure there are no solid particles. Allow the resin to rest for 5 minutes, then check for any bubbles or foam; if present, remove them or relocate them from the printing area. Close the jar promptly, as the product is sensitive to humidity, and store it under optimal conditions.
- **Print Profile Calibration:** independently confirm that the values configured in the printer software are suitable for printing your 3D model and its orientation. It may be necessary to adjust the exposure times for both Bottom Exposure and Exposure Time, depending on various factors such as the model's details, the printer, and temperature, based on your experience.
- **Base, Orientation, and Supports:** Ensure that the model features a base capable of adequately supporting the detachment of each individual layer; if not, construct a specialized docking base with an area exceeding that of the model itself. Verify that the model is fully adhered to the print base from the initial layer, thereby preventing any floating objects. Additionally, assess that the supports are sufficient to uphold all suspended points and confirm that the object's orientation facilitates the printing process, in accordance with the recommendations provided by the printer manufacturer.

Finishing and Post-Treatment Procedures:

1. **Detachment of the object:** carefully extract the printed object by prying the base from the printing platform using a scraper or specialized spatula. Exercise caution, as there is a risk of scratching the object at this stage. Drain the object and eliminate the majority of the resin adhering to the surface.
2. **First Wash:** When handling resin, it is essential to wear nitrile gloves and a protective mask while ensuring proper ventilation in the workspace. After printing the resin model, cleanse the photosensitive resin using ethanol or isopropyl alcohol detergent. For optimal results, ultrasonic cleaning for five minutes is recommended, followed by rinsing with water (tap water is acceptable during ultrasonic cleaning). Avoid leaving unused resin in the container tank for extended periods. If not used for a long time, the resin should be sealed in the container with transparent film to prevent contamination that could affect print quality. Store the resin at room temperature in a dark location, as sunlight contains ultraviolet rays that can polymerize photosensitive resins; a recommended storage temperature is between 5-25 °C. Note that lower winter temperatures increase the resin's viscosity. Ensure the container is sealed to protect against dust and moisture, which can compromise print quality. Residue on the surface of 3D printed resin parts can be removed with isopropyl alcohol or ethanol detergent. The cleaning duration should be sufficient to eliminate any sticky sensation on the surface and ensure no resin remains in the pores. After cleaning, carefully remove any residual alcohol from the model and expose it to UV light or sunlight, ensuring even irradiation of all parts until the surface feels dry and sufficiently hard. Use hand sanitizer or detergent to remove any resin residue from your skin, but avoid direct contact with resin washed with alcohol; always wear gloves, goggles, and a mask in a well-ventilated area.
3. **Blowing:** Allow the object to air dry completely or utilize compressed air for superior surface cleaning, preventing liquid residues from causing whitening or defects.

4. **UV Post-Curing or Post-Curing:** It is advisable to utilize UV ovens equipped with 405nm wavelength bulbs as a source for the surface hardening finishing treatment. We recommend UV ovens specifically engineered for 3D printing; the concurrent application of heat can facilitate the hardening process. Maximize aesthetics: To enhance the aesthetic appeal of the printed object and mitigate the natural color variation that resins exposed to UV light may exhibit, it is recommended to limit exposure in the polymerization chamber to no more than 6 minutes. For high-power LEDs, an exposure time of less than 4 minutes is advisable.
5. **Standard sterilization:** Immerse the guide in medical alcohol (ethanol) for approximately 10 minutes.

Proprerties:

- **Item Name:** 3DB-COMPACT GUIDE Defined Surgical Guide UV Resin
- **Curing wavelength:** 395-405 nm
- **Liquid density:** 1.05 to 1.25 g/cm³ (densitometer at 25°C)
- **Resin viscosity (NDJ-8S Rotational Viscometer):** 120 to 180 mPa s (25°C)
- **Storage conditions:** 5-25°C (stored in a sealed container and shielded from light)
- **Shelf life:** 24 months
- **Cleaning method:** Employ a detergent containing 95% or higher ethanol or isopropanol for cleaning, in conjunction with ultrasonic cleaning.
- **Post-curing method:** Following cleaning, the post-curing process occurs in a polymerization chamber for a duration of 4 minutes.

Suggested printed parameters:
(for printers with UV light intensity 3500-4500 μw/㎝ 6,6") :

- Optimal printing environment temperature: 25-30°C
- Recommended layer thickness: 0.05 mm (for more detailed results, use 0.03 mm).
- Bottom layer exposure time: MONO: 20-80 seconds (for 3D printers with light intensity of 3500-4000 μw/㎝²)
- Layer exposure duration: MONO: 2.5-3.5 seconds
- Lifting height: 6-10 mm
- Lifting speed: 40-80 mm/min
- Return/descent speed: 120-180 mm/min.
- Wavelength: 385-410 nm

Post-cure performance:

❖ Molding test environment: 50% RH ± 5% RH relative humidity, 23 ± 2°C temperature

Technical Parameters after Molding:

- Maximum strength (KGF): 113.6 ± 10%
- Tensile strength (MPa): 26.78 ± 10%
- Maximum force point deformation (mm): 13.87 ± 10%
- Elongation at yield point (%): 6.18 ± 10%
- Elongation at break (%): 24.45 ± 10%
- Ultimate flexural strength (MPa): 25.19 ± 10%
- Flexural modulus (MPa): 761.26 ± 10%
- Hardness (Shore D): 80-83
- Impact resistance (j/m): 31.8 ± 10%
- Tensile Modulus: 310.88 ± 10%

Risks and Recommendations:

- **Product Nature:** Photopolymer; for comprehensive risks, please consult the label and the Safety Data Sheet (SDS).
- **Intended Use and Application:** This technical product is designed for exclusive use by individuals proficient in handling Photopolymerizable Resins and flammable Solvents, possessing the requisite skills for operating 3D printers utilizing LED projector (DLP) or screen (LCD) systems. Keep out of reach of children; do not ingest; avoid contact with eyes and skin. Exercise caution when using this product.
- **Storage:** Each UV resin is a perishable product. For optimal storage, retain the resin in its original container, ensuring the container is securely closed and shielded from humidity. Store at room temperature between 5°C and 25°C, in a dark environment or away from light sources (or other energy sources), and protected from cold, in a well-ventilated area free from corrosive gases. Once the container is opened, reseal it promptly to minimize exposure to light and humidity, which may lead to the resin hardening either completely or partially.
- This product must not come into contact with the eyes, skin, or clothing, and it should not be tasted or ingested. Use exclusively in well-ventilated areas, ensuring proper air circulation and implementing protective measures. Clean thoroughly after use.
- This product is in liquid form and possesses a faint odor. It is advisable to wear a mask during application to prevent inhalation of aerosols and potential infection.
- This product must be stored in an airtight container, sealed promptly after use, and kept in a dry, well-ventilated area away from direct sunlight.
- In the event of accidental inhalation of the product, immediately vacate the area, swiftly relocate to a location with fresh air, and seek medical attention at a hospital if adverse reactions occur.
- In the event of accidental ingestion of the product, do not induce vomiting; instead, remain at rest and seek medical attention at a hospital without delay.
- In the event of skin contact, cleanse the affected area thoroughly with soap and water or seek medical advice.
- In the event of contact with the eyes, promptly open the eyelids and rinse with soapy water for approximately 20 minutes, then seek medical attention immediately.
- **Repeatability:** The characteristics of the material can vary significantly in terms of printing times, qualitative results, and final attributes, depending on the print settings, profiles utilized, geometry of the printed object, print orientation, and environmental conditions. In extreme cases, this may lead to total print failure.
- **Large Volume Printing:** The curing (crosslinking) of substantial quantities of resin generates heat (exothermic reaction), posing a risk of burns.
- **Disposal:** This product is not recyclable. Disposal methods differ based on state, regional, and local municipality regulations applicable to the user's business location. Adhere to the guidelines established by the regulations in effect in your area. Consult companies that specialize in the disposal of hazardous waste.
- **Manufacturer:** Shenzhen Yongchanghe Technology Co., Ltd, Address: 1001 Huaide International Building, No. 73 Fuyong Section, Guangshen Road, Fuyong Community, Fuyong Street, Bao'an District, Shenzhen, 518013, China (Tel: +86-0755-27889946) Contact: 3D Business S.r.l.