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Ultracur3D® DM 4505 N

User Guideline

Introduction

The following user guideline is for professionals who use: Ultracur3D® DM 4505 N.
The safety data given in this publication is for information purposes only and does not constitute a legally binding Material Safety Data Sheet (MSDS). The relevant MSDS can be obtained upon request from your supplier or you may contact MAM directly at sales@forward-am.com.
For more information, please refer to the country specific MSDS for advice.

Are you looking for an updated User Guideline version? Check out the latest online version here.

Storage conditions and disposal considerations

Keep container tightly closed in a room temperature, well-ventilated place. Keep container dry. If material is not being used, fill it back through a filter in the corresponding material bottle. The filter prevents cured pieces or failed prints from going back into the bottle. Ultracur3D® DM 4505 N must be disposed of in accordance with local regulations.
For more information, please refer to the country specific MSDS for advice.

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Intended use

Ultracur3D® DM 4505 N is a technical material based on (meth-)acrylate resin for suggested LCD and DLP systems. Working wavelength: 385 nm or 405 nm. Below, you can find some suggested 3D printers and printing parameters. For more information contact MAM directly at sales@forward-am.com.

Examples of suitable 3D-Printers and settings

	Wavelength	Power	Curing time	Voxel depth
Asiga Max UV	385 nm	7 mW / cm²	2.1 s	100 µm
Elegoo Saturn 2	405nm	2 mW / cm²	9 s	100 µm
MiiCraft Prime 150	405 nm	4 mW / cm²	3 s	100 µm
MiiCraft Ultra 125	405 nm	4 mW / cm²	3 s	100 µm
MiiCraft Ultra 125 Y	385 nm	4 mW / cm²	3.5 s	100 µm
Phrozen Sonic Mini 8k	405 nm	1.8 mW / cm²	8 s	100 µm
Nexa3D XiP	405 nm	3 mW / cm²	5 s	100 µm
Rapidshape i30+®	385 nm	2 mW / cm²	3.5 s	100 µm

If you cannot find your printer in the table or using the 3D Printing and Post Processing Settings Navigator you can use the values below as starting parameters. These are only approximations, different 3D printers may require different curing times and further optimization, but these values should be a good starting point.

The given values are all for printing at a layer thickness / voxel depth of 100 µm. If you need starting parameters for a different layer thickness, please contact us.

	405 nm Wavelength 3D Printer			
Power*	5 mW / cm²	4 mW / cm²	3 mW / cm²	2 mW / cm²
Suggested curing time	3 s	3.75 s	5 s	7.5 s

	385 nm Wavelength 3D Printer			
Power*	5 mW / cm²	4 mW / cm²	3 mW / cm²	2 mW / cm²
Suggested curing time	3.6 s	4.5 s	6 s	9 s

* Power measured directly on the glass

Design information

For designing the dental model and the mold for thermoforming, we recommend using only certified Software. If the model is hollow, make sure to have drainage channels (if no platform with holes is used) to make sure that the material is not trapped inside. For some hollow models, support structures might be needed. We recommend printing horizontal and always with a connector.

Printing process

The material should be processed at room temperature. Ultracur3D® DM 4505 N has pigment loading and therefore needs very thorough mixing before starting any print jobs. Color deviations or failed prints may occur when the material is not mixed properly. For the first filling of the vat, if regular shaking of the bottle doesn't work, we recommend rolling the material for 10-20 minutes. Pour it slowly in the vat and wait a couple of minutes, until the bubbles are gone before starting the print job.

The 3D printer examples and settings stated above are only for general guidance. The fully optimized settings should always be determined by the users themselves, according to their specific needs. Please always refer to the user manual of the employed 3D printer for instructions on printer settings and handling.

Remove the parts carefully from the build platform with a suitable tool, for more information, refer to the user manual of the used 3D printer.

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Cleaning and post curing process

Ultracur3D® DM 4505 N can be cleaned with water (preferably distilled or purified) **or** Glycol Ether based solvent like Ultracur3D® Cleaner and 2-propanol, please refer to either of the following cleaning procedures.

Cleaning with water (preferably distilled or purified)

- Step 1: Place the parts in a container filled with water and place this container in an Ultrasonic bath filled with water for 3 minutes. The cleaning time can vary depending on the complexity of the printed geometry.
- Step 2: Rinse the parts with water for a few seconds. Fine structures or holes may be better cleaned by using water and a syringe or by separate brushing. Next, place the parts in a container filled with fresh water and place this container in an Ultrasonic bath filled with water for 3 minutes.
- Step 3: Blow dry the parts with pressurized air or nitrogen, until the parts are clean.
- Remark: Even though water is used for the cleaning, this water will contain photopolymer traces after use and should be handled according to local regulations for chemical waste. Please refer to the MSDS.
- Step 4: Place the parts into a warming cabinet at 40°C (104°F) for 30 minutes to dry off any remaining cleaning solvent.
- Remark: Having a proper drying step for this material is important, otherwise some surface discoloration can happen.

Cleaning with Ultracur3D® Cleaner and 2-propanol (IPA)

- Step 1: Place the parts in a container filled with Ultracur3D® Cleaner and place this container in an Ultrasonic bath filled with water for 3 minutes. The cleaning time can vary depending on the complexity of the printed geometry.
- Step 2: Rinse the parts with 2-propanol for a few seconds. Fine structures or holes may be better cleaned by using 2-propanol and a syringe or by separate brushing. Next, place the parts in a container filled with 2-propanol and place this container in an Ultrasonic bath filled with water for 3 minutes.
- Step 3: Blow dry the parts with pressurized air or nitrogen, until the parts are clean.
- Step 4: Place the parts into a warming cabinet at 40°C (104°F) for 30 minutes to dry off any remaining cleaning solvent.
- Remark: Having a proper drying step for this material is important, otherwise some surface discoloration can happen.

Example of post curing procedures

Ultracur3D® DM 4505 N parts require adequate post-curing to achieve the optimal mechanical properties. After each post-curing cycle, the parts need to be flipped to achieve an even curing. After post-curing, remove any support structures and smoothen the surface if required.

	UV lamp	Power in mW / cm²	Duration of post-curing	Notes
Dymax ECE 2000 flood	Hg Metal Halide Bulb (broad spectrum)	Ca. 140 mW / cm² at 405 nm	2 x 300 seconds	Shelf height K
Nexa Wash + Cure	405 nm LED	Ca. 7 mW / cm² at 405 nm	2 x 30 minutes	
OtoFlash G 171	Flash-bulbs (broad spectrum)	Ca. 3.5 mW / cm² at 405 nm	2 x 3000 flashes	With Nitrogen
Phrozen Cure	405 nm LED	Ca. 12 mW / cm² at 405 nm	2 x 60 minutes	
Zortrax Curing Station	405 nm LED	Ca. 35 mW / cm² at 405 nm	2 x 10 minutes	

These proceedings are only general guidelines. In the end, the user has to determine the optimum post-curing procedure based on their specific requirements and the equipment used.

Frequently asked questions and other tips and tricks

1. **How many cycles can I use the same Water for cleaning?**

- This is very dependent on the part geometry and how much resin is left on the parts. In our experience, we can clean about 50 dental models with 1.5 liter of water before we need to take fresh water again. However, if the models are not getting clean, make sure to swap the water earlier. To save some water, we recommend cleaning in 2 steps (step 1 and step 2 above) using two separate water containers. You can then transfer the water from the “fresh” container into the “used” one after emptying the “used” one. This way you only have to refill one container instead of two. Make sure to clean the container from resin residues before filling either one with water.

2. **Can the water that was used for washing be recycled/purified and then used again for further washing of parts?**

- This might be possible e.g. through classical separation techniques like distillation, but this was not tested by us so far.

3. **Apart from dental models and molds, can I print other dental applications with Ultracur3D® DM 4505 N?**

- Ultracur3D® DM 4505 N was thoroughly tested and validated to print models for thermoforming, but any other application needs to be tested by the user themselves to see if it fits their requirements and needs.

4. **Can I print with other layer thicknesses?**

- Ultracur3D® DM 4505 N can be printed with 100 µm and with 50 µm. MAM did not develop any parameters with 50 µm at this point in time but in general it should be possible.

5. **Can I clean my parts with other solvents e.g. Ethanol?**

- Parts printed in Ultracur3D® DM 4505 N can be cleaned with Water, 2-propanol (IPA), as well as Ethanol.

6. **Why do my parts have surface defects (e.g. small holes)?**

- Make sure all bubbles are gone before starting a print job.
- Check your material vat/ foil if there are any defects.
- Depending on the machine and geometry reduce the printing speed and increasing the lift distance will give the material a chance to flow properly.

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Version 2.2