TECHNICAL DATA SHEET
REVISION: 1
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KLEBENRAD EP 80

3D PRINTING RESIN

CHARACTERISTICS

DESCRIPTION

KLEBENRAD EP 80 is a high-quality rigid epoxy resin for 3D printing. Sensitive to 405nm/120 UV wavelength.

Compatible with most DLP/LCD 3D printers.

MAIN FEATURES

- **Rigid finish**
- **High tenacity**
- **Low yellowing**
- **High print speed**
- **High chemical resistance post curing**
- **White and gray color**
- **High finishing precision**
- **Sharp and defined edges**
- **Mind odor**
- **Solvent free**
- **Low toxicity**
- **Easy to clean with Isopropanol**

PHYSICAL PROPERTIES

DESCRIPTION	STANDARD	VALUES
Viscosity 25ºC mPas	Brookfield (23ºC)	400+/-50
Density 25ºC g/ml	Pycnometer (23ºC)	1.15 +/- 0.05
Tensile strength	ISO 527	70 +/- 5
Elongation at break	ISO 527	4-5 %
Shore D hardness	ISO 868	80 +/- 2

PRINTING PARAMETERS

• Layer thickness recommended between 50 – 100 microns per layer.
• Exposure time recommended between 5 – 10 seconds, depending on the thickness of the layer.
• The first 6 layers are recommended with a minimum thickness of 50 microns and an exposure time of 30 seconds per layer to secure the model to the printing platform. For large pieces, increase the number of layers.
• Minimum up/down distance of the axis between layers 10 mm
• Minimum delay time before exposure: 2 seconds

POST CURING PARAMETERS

• Allow excess resin to flow from the model into the resin tank
• Carefully remove the model from the build platform
• Wash with Isopropanol
• Cure the model completely. Between 5 and 30 minutes are recommended with a UV LED light 405 nm 200 W depending on the thickness and color of the piece
• After post-curing, a slight yellow tone may appear on the piece, which will disappear in a few hours, returning the piece to its original color.

PRINTING RECOMMENDATIONS

- **Lack of adherence to the build plate**

We are looking to either increase the adhesion of the cured resin layer to the build plate or strengthen the adhesion of the resin to itself.

We recommend following the steps below:

1. <u>Check the hob is perfectly level</u>

For it, follow the manual of your equipment, which is summarized in:

1.1. Clean, dry, and set the build plate to the printer.
1.2. Make sure the screen is clean and without residue remains.
1.3. Arrange the calibration sheet on the screen if available.
1.4. Lower the build plate per machine according to directions to point 0.
1.5. Loosen the screws slightly and make sure the build plate can rotate freely.
1.6. Holding by hand and lightly squeezing retighten the screws to lock the build plate in place.
1.7. Mark as new 0 that position.

You should check if the build platform can reach the bottom of the resin tank. Sometimes a faulty limit switch can prevent the deck from moving all the way down.

2. Set exposure parameters

The goal of all photo-curable resins is to sufficiently adhere to the build plate. The adhesion of the resin must be stronger than the adhesion to the FEP sheet. When the plate is level but the resin is still adhering to the FEP sheet, you should check the exposure parameters, especially the exposure time settings for the initial layers and the exposure time for the other layers below.

The exposure time of the first layers depends on the resin and the printer model. Tables for specific exposure times can be found in the product data sheet.

The software of the machine usually allows to vary the exposure time of the initial layers and their number. It also allows you to change the exposure time of the rest of the print layers. Consult your printer manual.

If there are no exact values, check experimentally if longer exposure times of the first layer make a difference (e.g., 6-10 times the exposure time). In case the first layer sticks too much, reduce the exposure time of the first layers.

If the first layer does not adhere at all or the print comes off after only a few layers, the exposure time of the lower layers must also be adjusted. If the problem persists, you can perform a light exposure test. This determines the optimal exposure times for the respective printer and resin combination. A special test figure is loaded and the printer's firmware is temporarily changed. The first layer is partially illuminated. With the test print complete, the best exposure time can be determined.

3. Elevation Adjustments

DISTANCE

After each exposure phase, the print is peeled off the FEP sheet. During this process, the build platform is raised by a few millimeters or centimeters, according to the material. FEP sheet is flexible and should be able to stretch slightly. Usually, the print completely separates from the sheet and the new resin flows out before the build platform is lowered back down.

However, if the lift distance is not big enough, the print will not come off the sheet completely. Since no fresh resin can flow into these areas, the area itself continues to harden. Eventually the print will break at the weakest point and settle to the bottom of the resin tank.

There are usually good presets for the elevation distance setting. Reference values can be taken from the resin manufacturer's data. However, keep in mind the lift distance should be set higher for elastic materials than for rigid resins. Elastic materials are more likely to stretch as the build plate is lifted.

SPEED

The upload speed must be checked too. Depending on the speed setting, different strengths have an adverse effect on the printing process. Cavities within the print (called "suction cups") and the high viscosity of the resin can increase the load on the print.

Since the FEP sheet is elastic, it stretches to different degrees depending on how fast the build plate is lifted. Rise it up too fast increases the stress on the print, as well as the risk of it coming loose from the build plate.

Conversely, raise the build plate too slowly is also counterproductive. The FEP sheet then has more time to stretch. To compensate, the raise distance must be increased, which ensures that the print comes off the FEP sheet. The result is a significantly longer print time.

4. Configuration of the model to print

If the print still doesn't hold up after trying the above solutions, the problem may be caused by the position and configuration of the model to be printed on the build plate. A model must have enough contact with the build plate to adhere sufficiently to it. If only a few small areas of the model have direct or indirect contact with it, this is a possible reason why your print is not adhering to the build plate.

The solution is to increase the area of the model has contact with the build plate. For it we can put bases or plates that increase the contact area between the model and the construction plate, they are available in the printer software. In addition to the plates or bases, it is also worth looking at the support configuration in terms of thickness and point of contact of the support pillars with our model.

If a plate or more supports are not possible, you also have another option, although limited, to achieve a better print: model alignment. You can rotate the object, so a large flat surface is in contact with the build plate. This increases the chance of a successful print.

However, you should watch out for bowl suckers. Liquid resin can get trapped between the print and the FEP sheet. In such cases, the force required to peel the print from the sheet is significantly higher.

• Printing mistakes are always caused by a bad adjustment of the exposure times depending on the piece that we want to print:

- Low exposure time will decrease the curing of the resin and will not achieve sufficient mechanical properties to maintain the structure of the piece and will aggravate the problem of the suction process whereby the resin creates a suction effect on the plastic sheet in the wash. This deforms the piece and can cause problems of lack of interlaminar adhesion.

- An excessive exposure time, the curing of the resin will be very high and may cause detachment of the printing support and create interlaminar adhesion failures.

• Keep the working room tempered between 20 and 25ºC.

- Low temperatures increase the viscosity of the resins and can affect the curing of the piece and its reactivity.

- High temperatures will lower the viscosity of resins and may affect cure by increasing diffusion of oxygen into the resin.

RECOMMENDATIONS

• Shake well before use to homogenize the content.
• Recommended temperature: 20 – 25 ºC. At lower temperatures the viscosity of the resin will increase and make the printing process more difficult.
• Always wear gloves, in case of staining the skin, wash it with plenty of warm water and soap.
• Use it in well-ventilated areas.
• Store protected from direct sunlight and keep it out of the children`s reach.
• If the resin inside the printing tank is not going to be used for a long period of time, it is recommended to pour it into the original container using a fine filter to prevent remains of polymerized resin or contamination. After, close the container and store it in a clean and dry place.
• Keep the machine's protective cover protecting the print reservoir, even when printing is not working.

METHOD OF SUPPLY/ STORAGE

In recyclable plastic containers of 0.5, 1 and 5 kg.

It can be stored for 1 year in its original unopened container.

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