Digital ABS Plus

Overview

Digital ABS Plus™ materials simulate standard ABS plastics in combining high temperature resistance and high toughness. Parts printed with Digital ABS Plus and Digital ABS2 Plus offer:

- An impact resistance of 90-110J/m (1.69-2.06 ft lb/in.).
- An initial heat deflection temperature (HDT) of 58–68°C (136–154°F) upon removal from the printer.

A higher HDT of 82–90°C (179–194°F) can be achieved after thermal treatment in a programmable oven.

These properties make Digital ABS Plus and Digital ABS2 Plus suitable for printing parts that require high impact resistance, strength and dimensional stability.

Digital ABS Plus are fabricated using RGD515Plus[1] together with RGD531.

This document describes recommendations and tips for achieving optimum quality and enhanced mechanical properties when printing Digital ABS Plus parts.

- Cleaning printer components
- Preparing trays for printing
- Drying parts
- Photobleaching
- Thermal treatment

[1] Objet 1000™ and J4100™ printers (18 kg containers) use RGD515 Plus B.

stratasys

Best Practice

Digital ABS Plus

Figure 1: Functional prototypes 3D printed in Digital ABS Plus.

Printing Recommendations and Tip

Cleaning Printer Components

Micro-cracks adversely affect the mechanical properties of printed parts. To avoid micro-cracks:

- After a print job has completed, run the Head Cleaning wizard, the Wiper Cleaning wizard.
- If the Head Cleaning wizard is not run for 33 hours of printing, the wizard automatically opens when starting or resuming printing. If this occurs when a print job is interrupted, cancel the wizard to resume printing. (Run the Head Cleaning wizard after the print job is completed.)
- Every 15 minutes of printing, several sequences of purge are automatically performed.

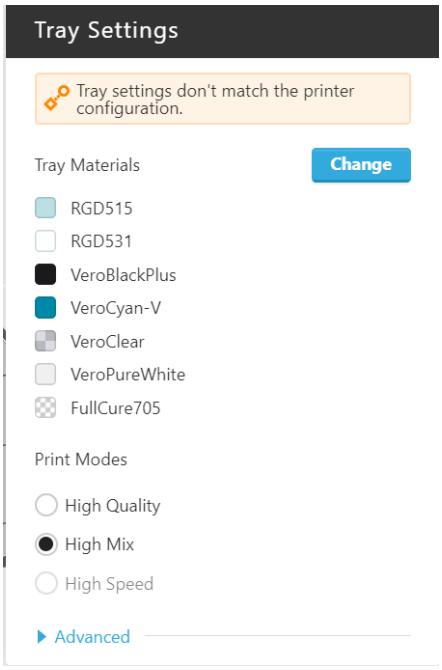

Figure 2: Digital ABS material selection in GrabCAD Print™.

Preparing Trays for Printing

To achieve optimum quality, follow these guidelines:

- Always prefer a matte surface finish. The support material that covers matte surfaces helps protect the part's layers from excessive UV radiation, thereby reducing the yellowish tint.
- If surface matching is required, place all matching surfaces face up.
- Internal stress may cause parts to curve upwards and detach from the tray. To reduce this possibility:
  - When printing parts that have a high aspect ratio (X:Y), position the longer edge along the Y-axis (Figure 3).
  - Prefer printing full trays. This enables easier removal of support material from printed models.

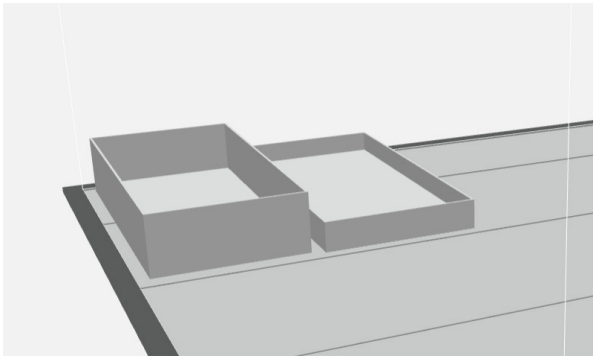

Figure 3: Long edge is along the Y-axis and matching surfaces are face up.

Digital ABS Plus

Drying Parts

Printed parts may require longer time to dry than parts printed with Vero™ materials. To dry parts thoroughly:

- Place them on a dry surface or on a drying rack.
- To avoid deformation, orientate the parts so that there is minimal strain on thin walls.
- Allow the parts to dry overnight.

Photobleaching Parts

Parts printed with Digital ABS Plus have a slightly yellow tint when removed from the printer. This is especially true for parts printed with a glossy finish. The yellow tint fades naturally over time, but you can greatly accelerate this process by using photobleaching treatment. This involves exposing parts to intense LED flood light.

Figure 4: Stratasys ProBleacher

Figure 5: Sample do-it-yourself photobleaching cabinet with LED lamp and mirrors

Recommended photobleaching methods include:

Method A: Stratasys ProBleacher™ (Figure 4)

- Sold and supported by Stratasys
- Temperature, light intensity, and duration control
- Office-friendly
- Fast and consistent results

Method B: Using LED Flood Light (Figure 5)

- Self-assembly from readily available components, including a cabinet lined with mirrors and a 100W LED flood light, 6500K daylight.
- Low-cost solution
- Varying results, due to the lack of precise control over temperature and light intensity

Method C: Using an Illumination Chamber

- Off-the-shelf chamber
- Enables controlling temperature and light intensity
- Assures predictable results

Digital ABS Plus

General Photobleaching Instructions:

1. For best results, polish the parts before performing photobleaching.
2. As soon as possible after printing, place the parts in the cabinet/chamber.
3. Arrange the printed parts with enough distance between them to allow light to reach all sides of each part.
4. Turn on the light and set the temperature (if applicable). Verify that the ambient temperature is between 30 – 40ºC (86 – 104ºF). Higher temperatures may cause part distortion; lower temperatures may not produce satisfactory results.
5. Inspect the model tint after six hours of treatment.

- For parts with a matte finish, this should suffice.
- For parts with a glossy finish, continue the photobleaching treatment for up to 24 hours to achieve the desired results.

Thermal Treatment

Thermal treatment of Digital ABS Plus and Digital ABS2 Plus parts in a programmable oven (Figure 6) improves their heat resistance.

Special Instructions:

To avoid distortion during the thermal post process procedure:

- Parts with thin walls and overhangs must be properly supported before placing them in the oven.
- Consider the best placement for the printed part inside the programmable oven. ·
- Place the part on a flat surface in the oven and not directly on the oven rack. The rack may exert forces on model.

Procedures A and B (below) are suitable for all part geometries. They differ in the duration and expected HDT. HDT test method: ASTM D 648-06, HDT at 0.45 MPa.

Figure 6: Inside of the oven chamber.

Digital ABS Plus

Procedure A

Desired HDT: 90°C (194°F)

Time in oven: approximately seven hours (including cooling time)

1. Clean the part and remove the support material.
2. Place the part in a programmable oven (see specification below) at room temperature.
3. Set the ramp-up rate to 1°C (1.8°F) per minute.
4. Increase the temperature to 60°C (140°F).
5. Turn on the oven. The oven temperature reaches 60°C (140°F) after approximately 35 minutes.
6. Maintain the temperature at 60°C (140°F) for two hours. Increase the temperature to 70°C (158°F). The oven temperature reaches 70°C (158°F) after approximately 10 minutes.
7. Increase temperature to 80°C (176°F) and maintain for one hour.
8. Cool in oven.
9. When the oven temperature is below 35°C (95°F), you can remove the part from the oven.

   Caution: Always wear oven gloves when handlings hot parts.

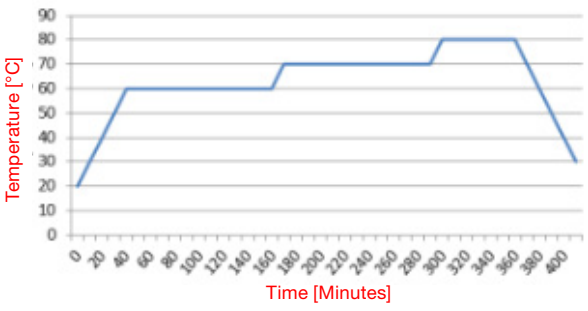

Figure 8: Oven temperature over time (Procedure A).

Procedure B

Desired HDT: 100°C (212°F)

Time in oven: approximately nine hours (including cooling time)

1. Clean the part and remove the support material.
2. Place the part in a programmable oven (see specifications below) at room temperature.
3. Set the ramp-up rate to 1°C (1.8°F) per minute.
4. Increase the temperature to 60°C (140°F).
5. Turn on the oven. The oven temperature reaches 60°C (140°F) after approximately 35 minutes.
6. Maintain the temperature at 60°C (140°F) for two hours.
7. Increase the temperature to 70°C (158°F). The oven temperature reaches 70°C (158°F) after approximately 10 minutes.
8. Increase temperature to 80°C (176°F) and maintain for one hour.
9. Increase temperature to 100°C (212°F) and maintain for one hour.
10. Cool in oven.
11. When the oven temperature is below 35°C (95°F), you can remove the part from the oven.

    Caution: Always wear oven gloves when handlings hot parts.

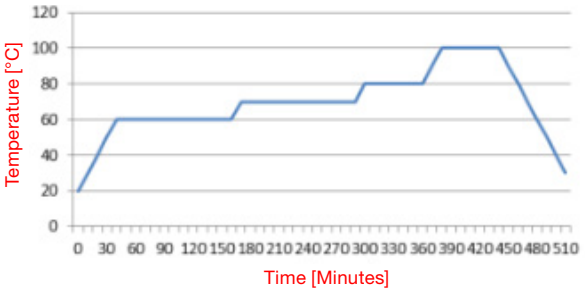

Figure 9: Oven temperature over time (Procedure B).

Digital ABS Plus

Programmable Oven

Recommended Specifications

Feature	Specification
Maximum Operating Temperature	250 – 300°C (480 – 570°F)
Temperature Stability (PID Controller On/Off)	±0.1/±0.2°
Temperature Uniformity	At 300°C±5° (at 570°F±10°)
Heat-Up Time to Maximum Temperature	25 minutes
Recovery Time to Maximum Temperature	4 minutes
Dimensions	As required
Volume (Liters)	As required
Air Changes Per Hour	10 – 50 (depends on oven size)
Maximum Power	Depends on oven size: 750W for 28-liter oven 9000W for 900-liter oven
Holding Power	Depends on oven size: 300W for 28-liter oven 3500W for 900-liter oven
Controller	Stores 4 programs and up to 16 segments (Eurotherm programmer, or similar)

Digital ABS Plus

Oven Manufacturers and Models

The following oven manufacturers and models are recommended by Stratasys and are available worldwide.

Manufacturer	Oven Model	Chamber Size	Comments
Despatch Industries despatch.com	LLB oven series	As required	May require an additional controller
Nabertherm nabertherm.com	TR oven series		

DOC-00733 Rev. E

USA - Headquarters
7665 Commerce Way
Eden Prairie, MN 55344, USA
+1 952 937 3000

EMEA
Airport Boulevard B 120
77836 Rheinmünster, Germany
+49 7229 7772 0

ISRAEL - Headquarters
1 Holtzman St., Science Park
PO Box 2496
Rehovot 76124, Israel
+972 74 745 4000

ASIA PACIFIC
7th Floor, C-BONS International Center
108 Wai Yip Street Kwun Tong Kowloon
Hong Kong, China
+ 852 3944 8888

GET IN TOUCH.
www.stratasys.com/contact-us/locations

stratasys.com
ISO 9001:2015 Certified