

SOFTWARE/**PRODUCT**/FINISHING

OVERVIEW

Digital ABS™ and Digital ABS2™ materials simulate standard ABS plastic, combining high temperature resistance and toughness. Parts printed with these materials have an impact resistance of 65-80J/m (1.22-1.5 ft lb/in) and an initial heat deflection temperature (HDT) of 58–68 °C (136 – 154 °F) upon removal from the printer. A higher HDT, 82–90 °C (179–194 °F), can be achieved after thermal treatment in a programmable oven (see section E).

These properties make Digital ABS and Digital ABS2 suitable for printing parts that require high impact resistance, strength and dimensional stability. With enhanced Objet Studio™ software (version 9.2 and higher) Digital ABS2 offers increased rigidity and durability for thin elements.

Make parts in Digital ABS and Digital ABS2 on Connex 3D Printers using RGD515 together with either RGD535 or RGD531. This yields printed parts in a choice of two colors, green and ivory.

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

- Cleaning Printer Components
- Preparing Trays for Printing
- Drying Parts
- Thermal Treatment



Figure 1: Models made of Digital ABS

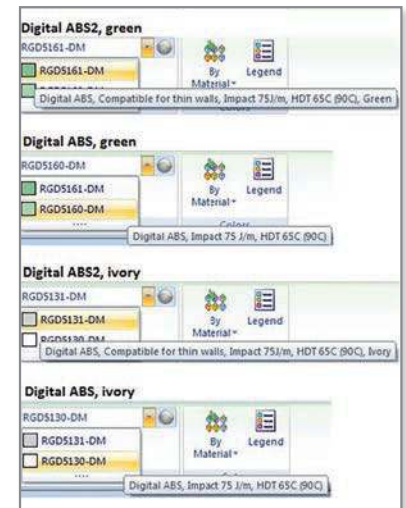


Figure 2: Digital ABS material selection in Objet Studio.

1. PRINTING RECOMMENDATIONS AND TIPS

1.1. Cleaning Printer Components

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

- Run the Head Cleaning Wizard and the Wiper Cleaning Wizard after a print job has completed.

NOTE: 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.)

After every 15 minutes of printing, several sequences of purge are automatically performed.

You cannot cancel the Head Cleaning Wizard to resume printing if head cleaning has not been performed for 99 hours.

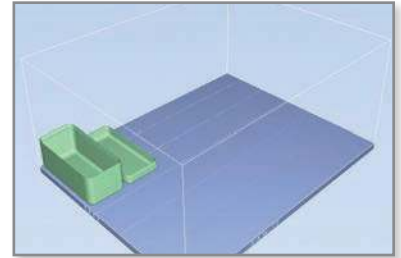


Figure 3: Long edge is along the Y-axis and matching surfaces are face up.

1.2. Preparing Trays for Printing

The arrangement of the parts on the build tray affects the quality of the printed parts.

- If surface matching is required, place all matching surfaces face up.
- Internal stress may cause parts to curve upward 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 (see Figure 3).
 - Use full trays when printing.



Figure 4: Suggested orientation for drying

1.3 Drying Parts

Parts printed with Digital ABS 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 (see Figure 4).
- Allow the parts to dry overnight.

1.4 Thermal Treatment

Thermal treatment of Digital ABS and Digital ABS2 parts in a programmable oven improves their heat resistance.

NOTE: The actual thermal resistance depends on the part's geometry.

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 the model.



Figure 5: Oven chamber

2. PROCESS

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.

2.1 Procedure A

- Desired HDT: 90 °C (194 °F).
- Time in oven: approximately seven hours (including cooling time).

Step 1: Clean the part and remove the support material.

Step 2: Place the part in a programmable oven at room temperature (see specification below).

Step 3: Set the ramp-up rate to 1 °C (1.8 °F) per minute.

Step 4: Increase the temperature to 60 °C (140 °F).

Step 5: Turn on the oven. The oven temperature reaches 60 °C (140 °F) after approximately 35 minutes.

Step 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.

Step 7: Increase temperature to 80 °C (176 °F) and maintain for one hour.

Step 8: Cool in oven.

Step 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 handling hot parts.

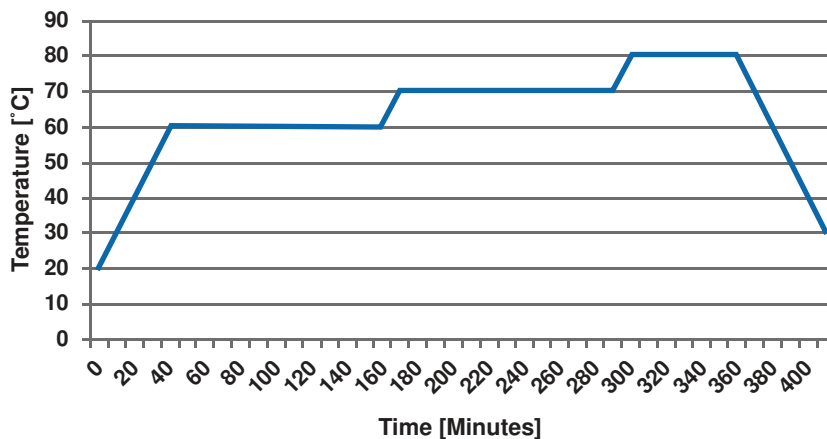


Figure 6: Oven temperature over time (Procedure A)

2.2 Procedure B

- Desired HDT: 100 °C (212 °F).
- Time in oven: approximately nine hours (including cooling time).

NOTE: This procedure may cause greater distortion to unsupported thin walls and overhangs. If this is a concern, use procedure A.

Step 1: Clean the part and remove the support material.

Step 2: Place the part in a programmable oven at room temperature (see specifications in section 3).

Step 3: Set the ramp-up rate to 1 °C (1.8 °F) per minute.

Step 4: Increase the temperature to 60 °C (140 °F).

Step 5: Turn on the oven. The oven temperature reaches 60 °C (140 °F) after approximately 35 minutes.

Step 6: Maintain the temperature at 60 °C (140 °F) for two hours.

Step 7: Increase the temperature to 70 °C (158 °F). The oven temperature reaches 70 °C (158 °F) after approximately 10 minutes.

Step 8: Increase temperature to 80 °C (176 °F) and maintain for one hour.

Step 9: Increase temperature to 100 °C (212 °F) and maintain for one hour.

Step 10: Cool in oven.

Step 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 handling hot parts.

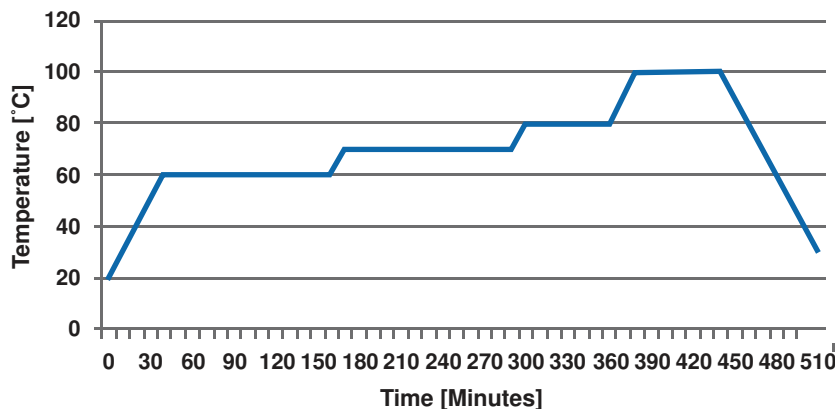


Figure 7: Oven temperature over time (Procedure B)

3. TOOLS & SUPPLIES

3.1 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 degrees
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: 750 W for 28-liter oven 9000 W for 900-liter oven
Holding power	depends on oven size: 300 W for 28-liter oven 3500 W for 900-liter oven
Controller	stores 4 programs and up to 16 segments (Eurotherm programmer, or similar)

Recommended Oven Manufacturers and Models

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

NOTE: Other manufacturers and oven models may be suitable if they meet the specifications listed.

Manufacturer	Oven model	Chamber size	Comments
Despatch Industries www.despatch.com	LLB oven series	as required	May require an additional controller
Nabertherm www.nabertherm.com	TR oven series		

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