

DUPONT™ HYTREL® 3D4000FL NC010

HANDLING AND PRINTING GUIDE

DuPont™ Hytrel® 3D4000FL NC010 is a high performance material for 3D printing. It is a thermoplastic elastomer material in filament form for fused filament fabrication. It is capable of being printed on a variety of printers in a variety of configurations.

Recommended Printing and Drying Conditions

Variable	Recommendation
Nozzle Temperature	205-250°C: Start at 230°C and increase or decrease the temperature by 5°C until the desired flow, adhesion, appearance and mechanical strength are established. With dry filament, 230-240°C is often the preferred nozzle temperature range.
Bed Treatment and Temperature	25-85°C: Generally, recommend starting at 40°C and increasing or decreasing the temperature by 5°C until the desired adhesion is established. Treating the bed with a PEI adhesive layer enables the use of a room temperature bed for a number of printers and builds, and treatment of the bed with glue stick aids adhesion and release. To facilitate release from the build surface, print at a lower temperature (25-50 °C) and then heat the bed to 70-85 °C before removing the part.
Percent Flow	85-130%: A lower percent flow is recommended for fine details, dimensional accuracy, and/or minimizing stringing. If there are gaps between adjacent lines, raise the percent flow to above 100%.
Printing Speed and # Shells	10-30 mm/sec: Start at 15 mm/sec; adjust according to desired print quality, time, etc. For enhanced dimensional accuracy and/or parts with challenging overhangs, recommend using 1 shell or perimeter. For improved strength, use 2 or more shells/perimeters.
Cooling Fan	80-100% after 1 st layer. Turn the cooling fan off while printing the first layer to promote adhesion to the bed.
Extruder	Direct-drive extruders, especially those designed for use with flexible filaments, are strongly recommended. For printers utilizing 1.75 mm filament and a feeding tube, by-passing the tube by positioning the spool feeding system a short distance above the hot-end can aid smooth feeding of the filament.
Drying Conditions	Use of a dry-feeding system is recommended. If the filament becomes wet, drying may be needed. Dry at 80°C under vacuum for 12 h or at 80°C in a hot air oven for at least 4 h.
Retraction Distance and Speed	1 -1.5 mm at 10-30 mm/sec for direct-drive extruders. Start at 1.0 mm at 10 mm/sec. Increase the retraction distance and/or speed to minimize stringing. Use of freshly dried filament and a dry-feeding system can significantly reduce stringing.
Bridging	Use printing speed of 15mm/sec and an extrusion multiplier of 0.85. Hytrel® 3D4000FL has successfully been used as a support material for itself. To facilitate removal of the support, select 15% line-infill, an x/y distance of 0.7 - 1 mm and a z distance of 0.2 – 0.25 mm. Remove the support material with a needle-nose pliers, using a twisting motion.

Recommendations are based on testing DuPont Hytrel® 3D4000FL on direct-drive Cartesian 3D printers with nozzle sizes varying from 0.25 mm to 0.6 mm

Material Handling: Hytrel® 3D4000FL is vacuum-packaged together with desiccant using moisture-resistant packaging. The supplied packaging should be kept sealed prior to using the filament in order to prevent moisture and dust pick-up. If the filament becomes wet, dry it according to the recommendations given in the table.

Safety: Consult the SDS for the safety properties of the material. Molten material and hot surfaces can cause thermal burns. Therefore, wear personal protective equipment for the hands, eyes, and body.

Printing Guidelines:

- Hytrel® 3D4000FL is capable of being printed on a variety of printers in a variety of configurations. Different printers, slicing and/or printing configurations, test conditions, ambient environments, etc. may give different results. Always consult your printer's manual and follow the recommendations of your filament provider.
- Clean the nozzle surface prior to printing to prevent pick-up of dirt from the nozzle.
- Extrude some material through the nozzle prior to initial printing and following production breaks.
- Remove the filament from the machine prior to shutting down the printer.

Troubleshooting:

- If the printed part has a rough surface, exhibits significant stringing, and/or if a popping or hissing noise occurs while printing, dry the filament and consider using a dry-feeding system for longer prints and if the environment is humid.
- If the strand does not exit the nozzle at a steady speed during material purging, if the diameter of the strand is too thin, and/or if there are gaps between the printed lines, try increasing the hot-end temperature, adjusting the tension on the extruder drive gear, increasing the extrusion multiplier, reducing the printing speed, and/or by-passing the feeding tube and feeding directly from above the hot-end. Dry the filament and use a dry-feeding system. Purge the filament in increments of 10 mm or less to prevent jamming of the filament.
- If filament grinding or jamming occurs, retract and remove the filament, cut off the part that is deformed and restart. Reduce the printing speed, raise the hot-end temperature, decrease the retraction speed, and/or lessen the retraction distance.
- If stringing/oozing of the filament occurs at the optimal nozzle temperature of ~230°C, lengthen the retraction distance, raise the retraction speed, and/or decrease the percent flow (e.g., try retracting for 1.5 mm at 30 mm/sec with 85% flow). Dry the filament and use a dry-feeding system.
- If black specks occur on the printed part, make sure that the nozzle surface is clean prior to initializing the print. Consider lowering the hot-end temperature.
- If warping occurs, add at least a 20-line brim around the printed part.

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