PA666

Grade coding

Addigy® F1030 is a strong, ductile and easy to print 3D printing grade based on PA666.

Material handling

Storage

In order to prevent moisture pick up and contamination, supplied packaging should be kept closed and undamaged. For the same reason, partially used bags should be sealed before re-storage.
Allow the material that has been stored elsewhere to adapt to the temperature in the processing room while keeping the bag closed.

Packaging

Addigy® F1030 grades are supplied in airtight, moisture-proof packaging.

Moisture content as delivered

Addigy® F1030 grades are packaged at a moisture level <0.05 w%

Conditioning before printing

To prevent moisture condensing on filaments, bring cold filaments up to ambient temperature in the print shop while keeping the packaging close

Drying

In case the filament has become wet, it should be dried. Using a hot air oven at 80°C for at least 4h is recommended. When storing the filament after printing, it is advised to seal the bag and add silica gel to the bag to keep the filament as dry as possible.

Machinery settings

Common fused filament fabrication (FFF) equipment should work with **Addigy®** filaments, direct drive as well as Bowden type extruders. Typical settings for any slicing software (e.g. Slic3R, Cura, Simplify3D) are listed below. Note that for different nozzle diameters the settings should be changed accordingly.

Nozzle diameter: 0.4 mm
Filament diameter: 2.85 mm, 1.75 mm

Print Speed:

50–100 mm/s (obeying the maximal throughput of the extruder)

Extrusion width:

0.4 mm (or at least equal to nozzle diameter)

Layer Height:

Layers: 0.1–0.2 mm
First layer: 100–150% of first layer thickness

Extrusion temperatures:

Extruder: 230°C / 446°F

Addigy® F1030 can be used with a range of nozzle temperature (220–245°C / 428–473°F). Preferred temperature to print your object is 230°C / 446°F. To generate a homogeneous melt, the melt temperature should always be above 225°C / 437°F. Optimal mechanical properties will be achieved at melt temperature between (225–245°C / 437°F–473°F).

Build plate Temperature:

Build plate temperature setting: 80–120°C / 176–248°F

Note, that prior to removing the printed part from the bed, the bed temperature should be lowered to ambient to avoid severe deformation of the part.

General processing settings

Build plate adhesion

For the best adhesion with **Addigy® F1030** it is advised to use an adhesive promotor, e.g. Dimafix®. PEI (polyether imide) build plate has shown to establish good adhesion, but to prevent warpage it should be of sufficient thickness. Adding a (large) brim to the print will help in establishing bed adhesion during the print as well.

Prior to applying an adhesive promotor, any surface must be free from dirt and grease. Therefore cleaning with ethanol or acetone is recommended.

Note: Prior to removing the printed part, the build plate temperature should be lowered to ambient temperature to facilitate separation and thus avoiding severe deformation of the printed part.

Additional guidelines

When entering the world of high performance polyamides for 3D printing, care should be taken of certain requirements and boundary conditions.

Addigy® F1030 series are a range of high performance filaments for extreme strength and ductility. These properties are closely linked to the crystallization level of the material. In order to achieve similar performance as a standard injection molding PA6 we maintained the high level of crystallinity. As a consequence of this higher crystallinity, finding the optimal printing conditions for ultimate performance needs more attention.

For **Addigy® F1030**, please take care of the following:

- Ensure good bed adhesion
- Heated print bed (>100°C / >212°F), the optimum is 110°C / 230°F
- Heated build chamber is preferred
- Dry filament is needed to get the best performance
- Ensure a homogeneous melt

Bed adhesion

Warpage stresses build-up during printing may lead to detachment from the print substrate when the adhesion of the print to the build plate is insufficient. Adhesion can be increased by either chemical or mechanical bonding.

Mechanical bonding will increase by using any measure that enlarges the contact surface between print and substrate e.g. by using a large brim or a perforated build plate.

Chemically the bonding can be optimized using the proper substrate material and/or an adhesive promotor ("glue"). Good results can be obtained using a polyetherimide (PEI) or (glass fiber reinforced) epoxy build surface eventually in combination with the mechanical bonding options.

Amongst the adhesive promotors, Dimafix® has proven to give good results. In all cases it is important that the build surface cannot deform together with the print so it should be stiff enough should and mounted well to the underlying structure.

When the adhesion is good the print will exhibit low warpage and will give the good performance as targeted.

Addigy® F1030 could generate less warpage stresses, so bed adhesion might be easier to maintain during printing. Dimafix®, 3DLAC® (or similar), Kapton tape on glass are the options for this grade.

Heated print bed

For the best results regarding adhesion and crystallization behavior of **Addigy® F1030** the build plate needs to be heated above 100°C / 212°F. Also the higher build plate temperature will result in better adhesion to the build substrate.

Closed and heated build chamber

A heated build chamber reduces the warpage and helps the fusion of the layers during printing. In this way the force is reduced and is delamination from the build plate less likely.

Dry filament

Polyamides are hygroscopic of nature which causes more problems during printing when it has absorbed high amounts of moisture. **Addigy® F1030** filaments are stored and packed under dry condition and when it arrives the filament is dry. To ensure the filament will be dry after use please store the filament back in the re-sealable bag with the silica gel pouches. In this way the filament can be used multiple times without having moisture issues. A preferred method is cutting the right amount of filament and store the rest of the spool back in the provided resealable bag. With this method, only the filament that is needed will be exposed to moisture. The best storage is in sealed plastic boxes that can be sealed with silica gel. This way ensures the filament to be dry for use.

The material can also be dried in a desiccant dryer for 4 hours at 80°C / 176°F. Make sure the spool is not deforming due to the temperature. Alternatively, a heat convection oven at 80°C / 176°F can be used. In this case, allow for a longer drying time.

Silica pouches can also be dried via this method.

Good temperature distribution

Make sure the printer is capable of heating up the nozzle to the required temperature.
Addigy® F1030 can be printed at 230°C / 446°F. Apart from printing issues as nozzle blocking, a too low temperature prevents proper bonding of the layers, which may lead to a too low strength of the printed part.

Dimensional accuracy

To get the desired dimensions of your printed part, thermal shrinkage should be accounted for. The model should be scaled-up to a certain factor prior to the slicing operation. The exact value of this factor is dependent on the printing conditions, but in general a value of 1.02 (2%) is recommended.

Safety

For the safety properties of the material, please refer to our SDS which can be ordered at our sales offices. During practical operation wear personal safety protections for hand/eye/body.

Startup/shutdown

Production has to be start with a clean machine. Starting the machine, extrude at least 50 mm of new filament through the nozzle. After printing with **Addigy® F1030**, purge the printer with PLA or PETG.

Remove the filament from the machine before shutting down the printer.

Production breaks

At restart after production interruptions exceeding a few minutes, purge the nozzle adequately.

Troubleshooting

Most common defects:

- Warping: Corners of the print lift and detach from the platform. Advice is to lower the build plate temperature. Wait long enough to allow the heat to dissipate to the top of the surface of the substrate.
- First layer not sticking / parts coming loose: the first layer of your print does not seem to want to stick or your parts come loose partway through the print. Remedies: check bed levelling and first layer thickness, increase size of brim, raise bed temperature, add appropriate adhesion promotor e.g. Dimafix® the build plate or change to PEI bed substrate.
- Filament grinding: The feeder wheels have ground a groove into the filament. Remove the damaged filament and start again, reduce printing speed, reduce retraction speed and length.
- Stringing: Unwanted strands of plastic span across the print. Lower nozzle temperature, enable retraction, or increase the retraction length.

More information at am.covestro.com

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