

Recommendation for processing

Drying of filaments before processing on 3D printer

Drying is important for the stabilization of the quality of every printed object (without the influence of storage conditions). The material may absorb moisture due to storage out of sachet or after a long time of printing when the spool is in the room. Some polymers absorb moisture only on its surface, but hygroscopic materials absorb it into the whole structure. Therefore, the materials were divided into **scale 1-5** (1 - not necessary to dry, 5 - always needed). See column "The need to dry" in Table 1.

Processing of moist hygroscopic materials at melting temperature causes that the water molecules attack polymer chains, which are irreversibly shortened.

The filament must be dried in the **device with exact thermoregulation** (ideally laboratory dryer) - before drying of the whole spool, put a little piece of filament into the device for the test of functionality. In the case that the material becomes softer or loses its original shape, lower the temperature of drying. In the case of loss of transparency, use a different device.

The spool can't be put into the environment without a controlled value of relative humidity after drying. **The cooling process** must be taken in the **desiccator** (or in the sealing box with the content of silica gel). If the hot spool is placed into the environment with higher humidity, the moisture may be absorbed back in about 10 minutes. And possibly on a higher level of moisture than it was before drying!

The moisture content in the material influences final properties, the polymer chains are cut and therefore:

- especially **mechanical properties** get worst (= MP), the material becomes more brittle, eventually more flexible,
- **stringing** occurs a lot (fine hair when moving the nozzle),
- temperature and chemical **resistance decreases**,
- **layer adhesion** gets worst, the entirety of the printed object is violated,
- **oozing** occurs (accumulation of material on the side of the nozzle, which may lead to release and contamination of object),
- the **nozzle** can be **clogged** because of the accumulation of degraded material,
- the **under-extrusion** leads to gaps, missing layers, dots, and holes in layers.

Table 1: Recommended conditions for drying of Fillamentum products

MATERIAL	MINIMUM TIME OF DRYING	TEMPERATURE OF DRYING	THE NEED TO DRY	THE CONTENT OF MOISTURE CAUSES:
CPE CF112 CARBON	5 h	75 °C	5	stringing, MP, oozing
CPE HG100	5 h	75 °C	5	stringing, MP, decrease of temperature and chemical resistance, bubbles, "foamy" appearance of printed object
FLEXFILL PEBA 90A	5 h	70 °C	5	stringing, MP, bubbles, low layer adhesion, low bed adhesion, surface quality
FLEXFILL TPU 92A	3 h	80 °C	5	stringing, under-extrusion, clogged nozzle
FLEXFILL TPU 98A	3 h	100 °C	5	stringing, under-extrusion, clogged nozzle
NYLON AF80 ARAMID	4 h	80 °C	5	MP, colour change
NYLON CF15 CARBON	4 h	80 °C	5	stringing, MP
NYLON FX256	3 h	80 °C	5	stringing, MP, bubbles
PC/ABS	4 h	80 °C	5	stringing, MP, surface quality
PETG	4 h	65 °C	5	stringing, MP, bubbles, sputtering, "foamy" appearance, under-extrusion
PLA CRYSTAL CLEAR	4 h	50 °C	5	stringing, MP, clogged nozzle, optical clarity
PLA EXTRAFILL	3 h	50 °C	5	stringing, MP
TIMBERFILL	2 h	50 °C	5	stringing, MP
ASA EXTRAFILL	2 h	80 °C	3	process instability, low layer adhesion in case of colour Metallic Grey
ABS EXTRAFILL	2 h	80 °C	2	process instability
FLEXFILL TPE 96A	2 h	80 °C	2	/
FLEXFILL TPE 90A	2 h	80 °C	2	/
HIPS EXTRAFILL	3 h	70 °C	1	/
PP 2320	2 h	80 °C	1	/
VINYL 303	2 h	70 °C	1	/