Material Guide

Original Desktop Filament Extruder **E1.5** und **E1.6**
by ARTME 3D

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1. drying:

Plastic granules should be dried before processing, as many plastics absorb moisture from the air, which negatively affects extrusion. If you do not have access to a drying cabinet or granulate dryer, this can also be accomplished with a commercial convection oven. Here you can find empirical values for temperature and drying time depending on the material: (Source: 3d-druck-comminuty.de)

Material	Temperature	Duration hrs
PLA	45°C	> 4h
ABS	60°C	> 2h
PETG	65°C	> 3h
Nylon	70°C	> 8h
ASA	60°C	> 4h
TPU	50°C	> 4h
PVA	45°C	> 4h

2. grade purity and color separation:

Keep plastics sorted by type. Never mix different types of plastics. It is also advisable to separate materials by manufacturer. Even if you process one type such as PLA, the properties may be different from other manufacturers.

Separating by color also makes sense, as you can then create a new color if you specifically mix two or more colors. If you mix too many colors, you will get a brown or gray filament.

3. Grain size and flowability:

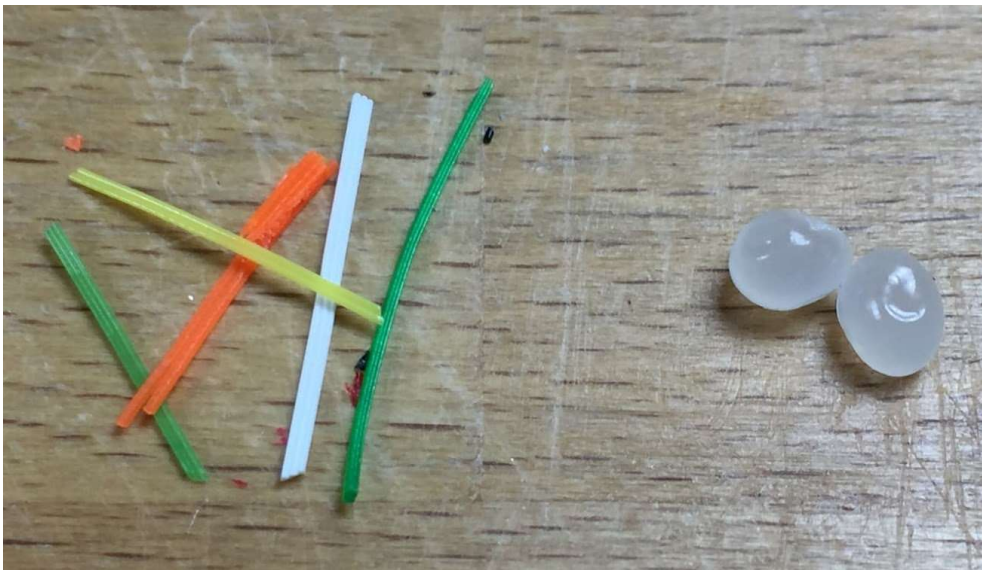
For ready-to-use (industrial) granules/pellets:

Each grain must not be longer than 5mm on the longest side. All other sides must be smaller than 4mm.
Industrial granules trickle well. Therefore, the hopper part 2 should be used to ensure a uniform filling neveau in the feed zone.

For self-produced granules (shredded 3d pressure drop):

Each grain should not be longer than 4.5mm on all sides. This can be ensured by sieving the material before use. The sieve should have a mesh size of 4 to 4.5mm. Homemade granules must be mixed well homogeneously. Another criterion of homemade granules is their pourability. Compared with brand-new granules, homemade granules from plastic waste usually flow much less easily. It also tends to

bridge. This means that cavities form in the pellets as they become wedged at narrow points in the hopper and therefore no material can reach the extruder screw, even though the hopper is apparently full. The design of the extruder is intended to prevent this. On the one hand, the shape of the hopper is designed for this, and on the other hand, a type of agitator is attached to the coupling between the extruder screw and the drive motor. This prevents bridging in the feed section. When using self-produced pellets, the hopper part 2 should be removed. When collecting 3D printing waste, please note the following:Thin strips, which result from a "brim" or skirt on the print bed, are difficult to shred and can obstruct the material flow in the feed zone of the extruder. Therefore, please sort out such parts or do not collect them:



4. cleanliness:

Protect any type of granules from dust and contamination. Use containers with lids. The melt filter in the nozzle only ensures that the filament is processed on 3D printers with 0.4mm nozzle. Many other types of contaminants cannot be stopped by the filter or cause the filter to clog prematurely.

5. storage:

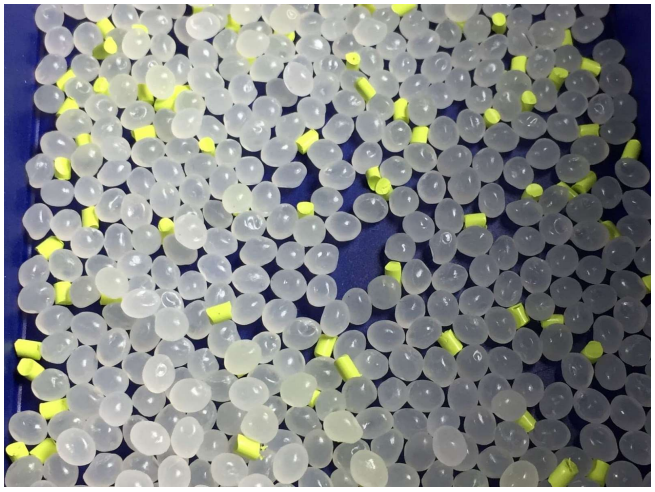
Store all forms of plastic granules in containers with lids. Ideally, the container should be as airtight as possible. Place a large bag of silica gel in the container to keep the material dry. Also store 3D printing waste that you collect for later processing this way.

6. processing temperatures guide values:

Current empirical values can be found in the "empirical values" for download at www.artme-3d.de/support.

7. addition of color pigments/masterbatches:

The mixing capacity of an extruder in this small design is limited. Coloring is possible but limited in homogeneity. There are masterbatches that negatively influence or interfere with the extrusion performance. Therefore, start only with a small amount and feel your way to a maximum addition.



8. extruder start-up with shredded 3D printing waste:

To extrude shredded 3D printing waste, proceed as follows:

- Heat up the extruder (e.g. PLA approx. 175-180°C).
- After heating up, start the extruder at a relatively slow speed (approx. 5RPM).
- Then increase the temperature again by about 20°C up. This increases the temperature in the feed zone, which supports homogeneous conveying of the shredded material.
- When the temperature is reached, lower it again to the processing temperature and increase the RPM. The material initially comes out of the die quite thin.

- Allow the extruder to run until the temperature and material flow have stabilized before starting to wind. This is the case when the material appears less fluid, expands more as it exits the die, and suddenly flows a little slower.
- Now you can start the rewind. (See operating instructions)

9. processing 3D printing waste into granules:

Shredding 3D printing waste usually requires powerful and expensive machines. In the following I would like to show several possibilities:

The most convenient solution with the best granule quality is a normal industrial shredder, also called a granulator or granulator. Such devices ideally have toothed cutting blades and an interchangeable screen, so that you can determine the granule size. However, this will take a little more money and often require a power connection.

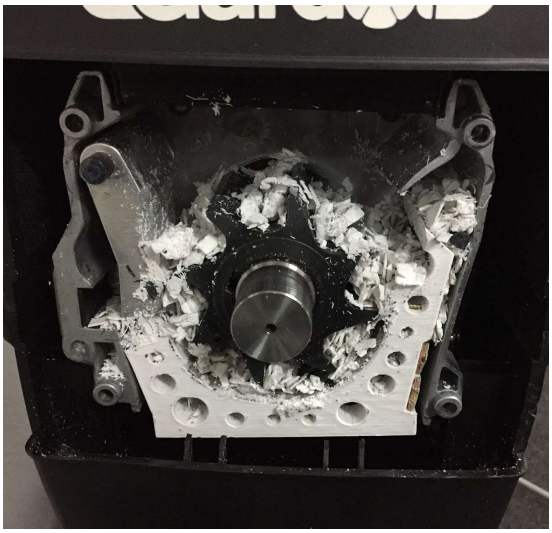
An open source solution for powerful shredders comes from the Precius Plastic movement. Ready-made machines can also be bought in the online bazaar: https://bazar.preciousplastic.com. But even these devices are not very cheap:

On a small scale, a so-called side mill or sprue mill can also be used. Here is an example:

These types of mills can be found cheaply from time to time in classified ads or industrial auctions. These mills also have a built-in sieve. The disadvantage of these mills is that the inlet is quite small and larger 3D prints must be pre-shredded and a heavy current connection is also necessary.

A good and cheaper approach is a roller shredder:

This can be used to pre-crush parts so that they can then be processed with a side mill. I'm working on incorporating some sort of sieve support into such devices. this spins the material in a circle and crushes it until it can fall out through the sieve. This produces usable granules:



It is important to use a shredder with a slowly rotating knife roller. Normal, high-speed blade shredders would melt the plastic. I have found, however, that very cheap units put some metal debris into the grind, which can discolor the material and cause the melt filter to clog early. But in general, these units work quite well, they have good power and can be run from a standard electrical outlet. High quality roller shredders are also quite quiet. However, there is a limit here in the size of the waste to be processed. Large pieces must be pre-shredded with a hammer or saw. First tests were very promising, though. However, I currently lack budget and time. If you would like to support me in the further development of the shredder, I would appreciate a small donation via Paypal to paypal@artme.de. My developments will be published continuously and maybe I will offer DIY-kits.