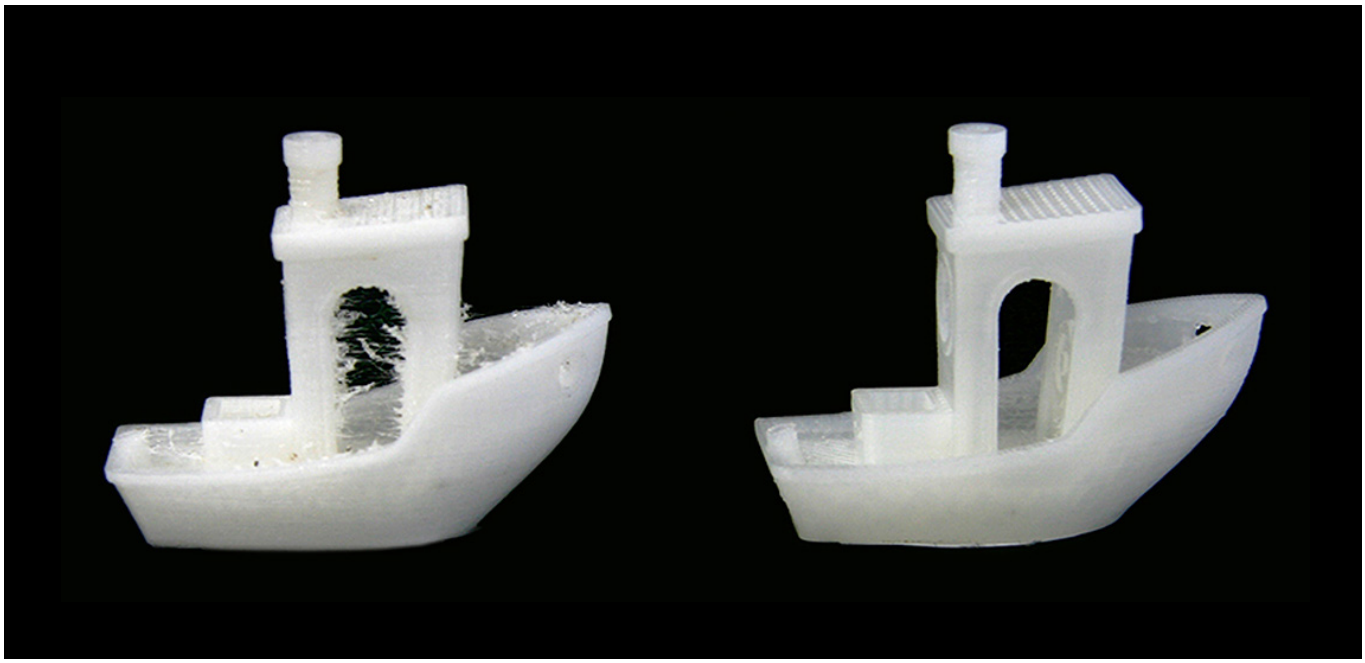
MASS PORTAL®

Filament Dryers

Professional filament drying solution
for open-materials 3D printers

Why do you need to dry?

To achieve better printing results
with moisture sensitive thermoplastic materials



3D Benchy printed with undried and dried filament, using same printing settings and same g-code

Drying, conditioning and feeding filament under optimal conditions unlocks the full potential of 3D printing materials

Many polymers absorb moisture from the ambient atmosphere. As the water molecule is polar, it can easily form hydrogen bonds with polar functional groups in polymers. First, moisture condenses at the filament surface (so-called surface moisture), but after some time moisture will also penetrate inside the material (so-called bulk moisture). Both moisture types have a tremendous negative effect on the processing of the most polymer materials when water reacts with polymer molecules and breaks them into smaller ones (hydrolysis).

Stable processing
While filament manufacturers spend considerable time to create moisture-insensitive filaments, there are still quite a few materials which have to be dried prior to printing. Using Mass Portal FD dryers ensures a more stable printing process, thus allowing you to print bigger parts more reliably with moisture-sensitive materials like Nylon or TPU.

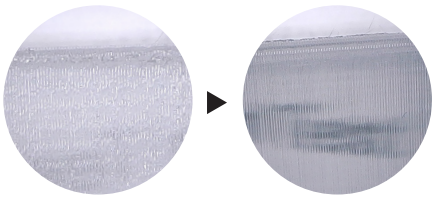
Better mechanical properties
Hydrolysis causes a considerable decrease in mechanical properties of 3D printed parts, which can lead to the delamination or even structural failure of 3D printed parts in service.

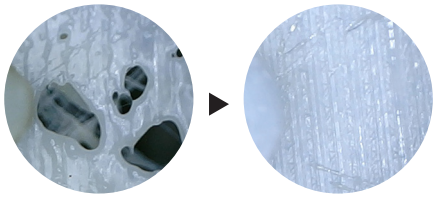
Fewer cosmetic defects
Using Mass Portal filament dryers can eliminate a number of moisture-related 3D printing defects.

Drying impact on 3D printed parts

Drying reduces moisture-related 3D printing defects, and noticeably increases printing success rate

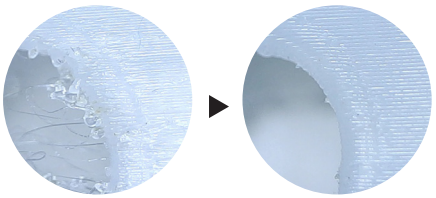
Foaming and bubble formation
At polymer processing temperatures water evaporates, expands, and forms bubbles in polymer melt, which cause bad optical properties of 3D printed parts and melt path discontinuity

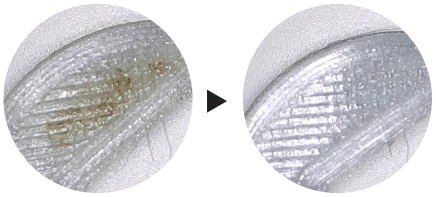




Bad surface quality, curling
3D printed parts from dried materials are usually smoother

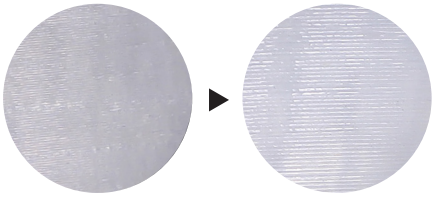
Oozing and stringing
3D printed parts from dried materials usually show less oozing and stringing

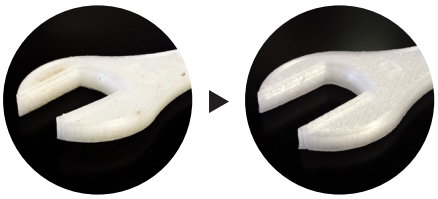




Colour changes
Hydrolysis products often lead to color changes in 3D printed parts

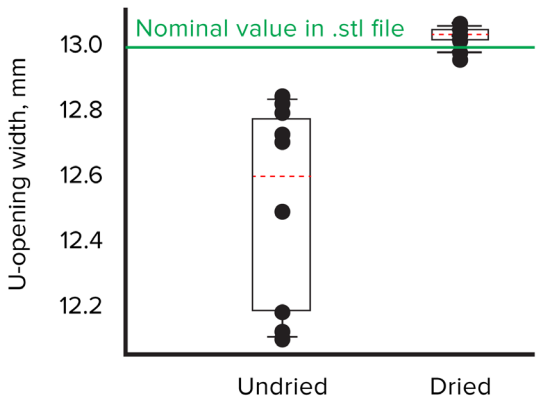
Poor interlayer adhesion
Hydrolysis deteriorates mechanical properties of polymer, which can lead to the delamination during printing or even structural failure of 3D printed parts in service





Warping
3D printed parts from dried materials are usually less prone to warping

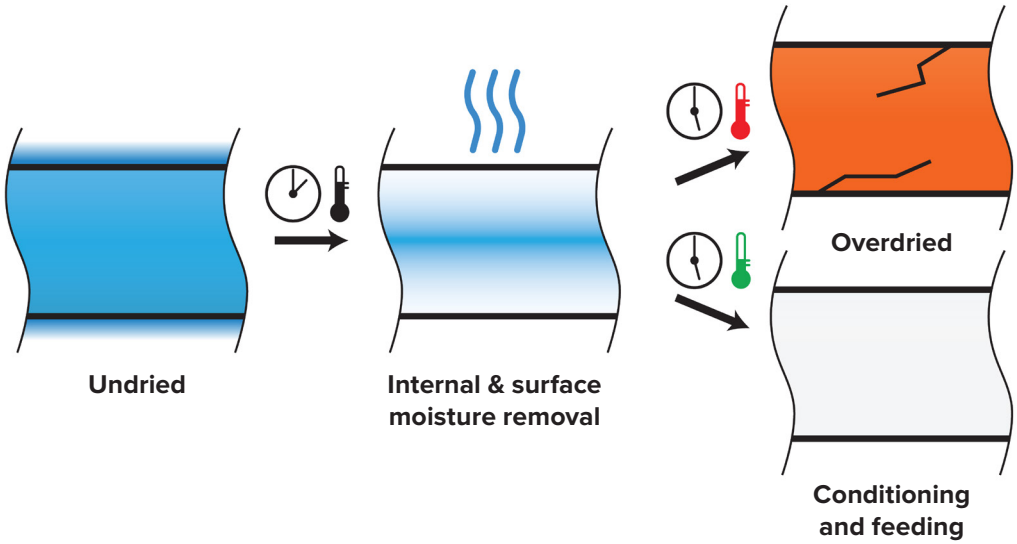
Drying effect on dimensional stability of 3D printed parts



Boxplot shows the U-shaped opening width of the spanners printed with undried and dried PC material. The width of the U-shaped opening in the parts printed with the dried material has a much narrower value spread and is much closer to the nominal value of 13 mm.

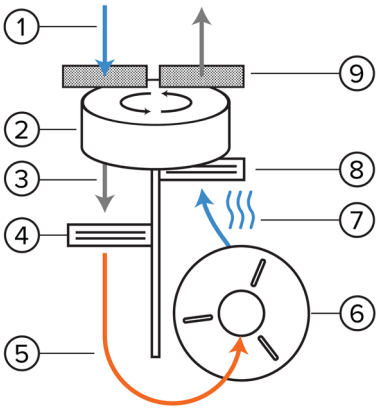
How does it work?

A two step process: drying and feeding under controlled conditions



No matter how carefully one stores a filament eventually it will absorb some moisture on the surface and in the bulk. This moisture will react with polymer macromolecules during 3D printing resulting in different 3D printing defects and artefacts. Drying is a pre-processing step meant to remove excess moisture from the filament. In a typical drying process of an off-the-shelf filament, first, the surface moisture will get depleted. After longer drying time the bulk moisture will get depleted as well. At this point, if one continues to dry the filament at the same conditions, it can result in an overdried filament, which is unwanted and often is irreversible. To avoid this, the filament should be conditioned and/or fed at a lower temperature during the 3D printing process.

Working principle



In Mass Portal FD dryers the incoming ambient air is sucked through a set of filters (1) into the drying chamber. Next, the air is flowed through a rotating desiccant disc (2) to reduce the water content in it. This a characteristic feature of Mass Portal filament dryers, and also the main difference between our dryers and drying in an oven or in fruit dryers, because the lower is the moisture content in the incoming air, the more efficiently it can absorb the evaporating moisture from the 3D printing filament, moreover less heat is needed to heat up air with a lowered moisture content. Next, this partially dehumidified air (3) is heated up by the resistive heaters (4). The hot air (5) flows around the 3D printing filament (6) and heats it up. The temperature, however, may not exceed the softening point of the 3D printing filament or spool material at any point of the drying process. The excess moisture evaporates from the 3D printing filament and is carried away with the flowing air (7), which is heated up by a heater (8) to partially regenerate the rotary desiccant disc (2). As the rotary desiccant disc rotates automatically the whole disc can be regenerated periodically, and no maintenance or replacement is needed. The processed air is then expelled from the drying chamber through another set of filters (9).

Which materials should be dried?
ABS, PMMA, PA (Nylon), PC, PET, PETG, POM, TPU, advanced filaments like CF filled PA or flexible filaments should be dried before printing. We also recommend to feed preconditioned PLA or PP filaments, because it can improve the reliability of the printing process.

How long does it take to dry a filament?
On average it will take around 5 h at 60 - 80 °C to dry a 1 kg filament spool, depending on the specific type of filament and the initial moisture content. Note that drying settings can vary largely even for nominally the same filaments coming from different manufacturers.

Simple to use

Dryers come with a number of preset drying profiles

The main drying parameters are drying temperature, airflow velocity, and drying time. Mass Portal filament dryers provide an option to control all these parameters.

Drying profiles for branded materials

If you have a branded filament, we advise you to use manufacturer- or Mass Portal-approved drying profile settings which can be found in FabCloud™ database (www.fabcloud.net). These settings are optimal and have been tested internally, so using them will not result in an overdried filament.

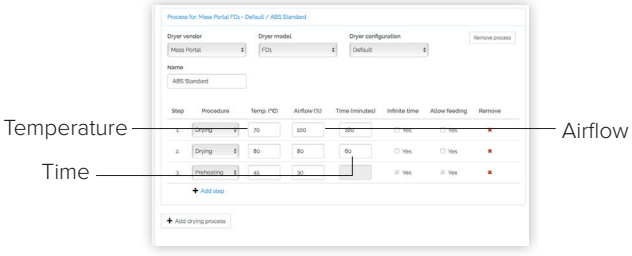
Drying profiles for generic materials

If you do not find your filament in FabCloud™ database, we advise you to use the so-called generic settings for different classes of polymers. Generic drying profile settings are based on the typical temperature values used in the polymer industry, but considering all the additives producers put into 3D printing filaments these values should be rather seen as guide values, which can (and should) be adjusted if needed.

Custom drying profiles

If you have a custom 3D printing filament you would like to dry, you can set up your own custom drying profile, consisting of several drying steps at different temperatures and airflows. You can also save your custom drying profiles for later use.

Embedded dryer status display



Online tool for creating multistep procedures

Multistep drying profiles

You have a full control over the drying process and, if needed, you can set up and save custom multistep drying profiles (e.g. first, drying at 70 °C for 1 h, then at 75 °C for 2 h).

Direct feeding

After the main step is done, the filament can be conditioned or directly fed into the 3D-printer at lower temperatures.

Computer controlled

Once you have started the drying process, the program will consecutively run through all the steps. You can also configure email notifications to keep up-to-date on the drying progress.

Professional grade hardware

Durable construction for long service life
— either on desktop or in rack

Touch screen display
Touch screen display allows control and overview of drying procedures and drying progress

Thermally insulated walls
Walls are thermally insulated to reduce heat losses

Front loading
Ergonomic front loading design ensures easy swapping of filament

Durable housing
Robust and easy-to-clean aluminium housing and glass front door

Rotary desiccant wheel
Automatic rotary desiccant wheel system to dehumidify the incoming air

Filters
Set of replaceable HEPA and active carbon filters to limit amount of exhausts, and filter dust particles

Options for wired or wireless connection
USB and Ethernet jacks, and Wi-Fi

Feeding tube
Dried filament is fed through a teflon tube directly into 3D printer to limit moisture regain

Easy to deploy

- Compact device with small footprint
- Desktop or rackable model
- No compressed air required
- No chilling water required
- Low vibration level
- Low noise level
- Ergonomic front-loading

Easy to use

- Touch screen display
- Single-click selection of drying profiles for standard materials
- Cloud-based database with manufacturer-approved drying settings for branded materials
- Possibility to create your own drying profiles

Safety

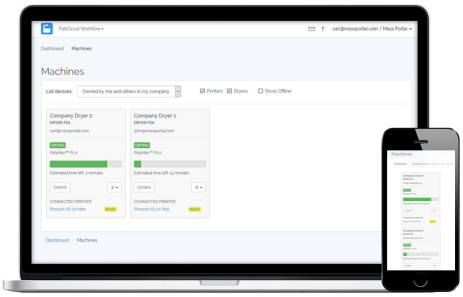
- Built-in overcurrent protection
- Built-in overheating protection
- Set of replaceable HEPA and activated carbon filters
- Door open / close sensors

Connectivity

- USB and Ethernet jacks, Wi-Fi to connect to FabCloud™ system to manage your drying settings, to access shared drying settings, and software updates

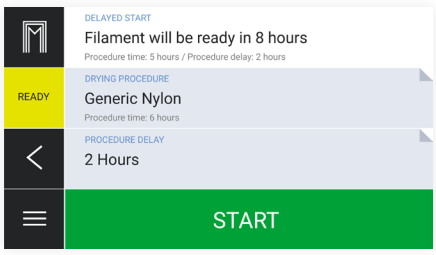
Comprehensive software

Set up, manage, and share your drying and printing profiles



Dryer

Embedded dryer software with an intuitive user interface enables you to set up, select, and edit drying procedures. Single-click selection of drying profiles is available for the most popular filament types.



Delayed start option

Using the delayed start option you can have your freshly dried filament ready by the time you need it. This enables you to schedule drying in advance so that you can manage your time wisely.

FabCloud™ management

The loud-based FabCloud™ software enables you to set up, select, edit, manage, and share drying procedures. You can set up, and share printing profiles for different materials as well.

Monitor drying and printing progress

Using our software you can monitor the drying or printing progress distantly from your computer or smartphone. Save time and improve efficiency with FabCloud™ Workflow machine management software. Configure email notifications from your 3D printing devices with status updates to know when drying or printing has been finished or when operator attention is necessary.

Access up-to-date drying and printing settings

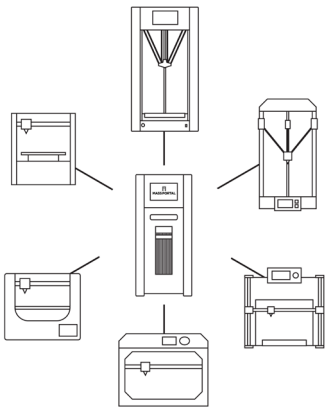
FabCloud™ database enables you to access the up-to-date manufacturer-approved drying and printing profiles. This way you can always be sure you are using the correct settings.

Printer

All Mass Portal filament dryers can be jointly used with Mass Portal printers: when connected to 3D printer dryers can be controlled by the master 3D printer. To ensure a stable printing process with Mass Portal printers, the printing is only allowed to begin after the filament has been dried and prepared for feeding.

Compatible with the most open-materials 3D printers

In a standalone operation mode, Mass Portal filament dryers are compatible with the most open-materials 3D printers using standard filament sizes: 1.75 mm / 2.85 mm / 3.00 mm.



MASS PORTAL®

Filament Dryers

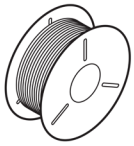
Professional filament drying solution for open-materials 3D printers

Mass Portal FD1

Supported filament sizes

1.75 mm / 2. 85 mm / 3.00 mm

Supported spool sizes



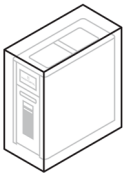
Diameter: 200 mm
Width: 80 mm

Temperature range

Minimum temperature: 40°C
Maximum temperature: 80°C

Product dimensions

Dryer (w × d × h)
25 cm × 44 cm × 52 cm
18 kg



Packaged dryer (w × d × h)
34 cm × 52 cm × 60 cm
20 kg

Power supply

400 W

MASS PORTAL®

3/11 Pulka str., Riga, LV-1007, Latvia
E-mail sales@massportal.com
MassPortal.com

Document version: 23.01.2018

Specification subject to change