USER MANUAL

User manual

Date: 16.09.2019

REFERENCE VERSIONS
Device title: Filament Dryer
Manufacturer: **SIA PURPOSE AM SYSTEMS LATVIA**

WEEE group: 3 (IT and/or telecommunication equipment)
Device use: indoor only
Power supply: 210..250 VAC, 5A, 1,2KW
Working temperature range: 18 - 38 °C
Working level of relative air humidity: 85 % or less
Net weight: 35 kg
Serial number is located on the back side of the device.

Contents

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Glossary

Desiccant - a hygroscopic substance used as a drying agent

Drying - a mass transfer process resulting in the removal of solvent by evaporation from an object

Conditioning – a process of a 3D printing filament at constant conditions.

Filament dryer - an electro-mechanical device for 3D printing filament drying and feeding

Firmware - the software that runs on your Purpose Filament Dryer and controls it entirely

Moisture - water or other liquid diffused in a small quantity as vapor, within a solid, or condensed on a surface.

Regeneration - a process of drying the desiccant to remove the water

Safety & Compliance

Please read carefully through this chapter. It describes the safety measures you have to take when using the Purpose Filament dryer.

The filament dryer is an electro-mechanical device that has hot parts when in operation. You must always operate the dryer with caution and follow instructions in this Manual.

WARNING: Indoor use only
The dryer is meant for indoor use only. Do not expose the filament dryer to rain or snow. Always keep the filament dryer in a dry environment at a minimum distance of 30 cm from other objects.

WARNING: Hot surfaces and parts
During its operation the Purpose Filament dryer can generate high temperatures. Always allow the Purpose Filament dryer to cool down before you reach inside the drying chamber or move the dryer. Wear heat protecting gloves when taking out hot filament spool out of the device.

Do not cover the top part desiccant module part and back of the filament dryer during its operation.

WARNING: Intense odors
Plastic odors can be emitted during the operation of Purpose Filament dryer. Make sure to set up the Purpose Filament dryer in a well-ventilated room.

WARNING: Allergy hazard
If any allergy develops as a result of direct or indirect contact using Purpose products, discontinue use immediately.

WARNING: Moving parts hazard
The Purpose Filament dryer includes moving parts that can cause injury. Never reach inside the Purpose Filament dryer while it is in operation.

WARNING: Choking hazard
The Purpose filament dryer and its consumables may include small parts that may constitute a choking hazard; additionally, these products may be used to manufacture objects that may themselves constitute a choking hazard.

WARNING: Not a toy
The Purpose filament dryer is NOT A TOY; children under the age of 16 should use the product under adult supervision.

WARNING: Electrocution hazard
There is a risk of electrical shock. This product is not user serviceable.

WARNING:
Do not leave the Purpose Filament dryer unattended during operation.

WARNING:
In case of emergency disconnect the Purpose Filament dryer from the power outlet.

WARNING:
Any parts printed from filaments dried in the Purpose Filament Dryer are not certified for food safety nor should they be regarded as food-safe, therefore, should not come in contact with the mouth or foods/liquids that will be ingested by humans/animals.

PRECAUTION:
Any parts printed from filaments dried in the Purpose Filament dryer should not be used for medical applications, such as, but not limited to, implantation, drug delivery, or ingestion.

REPAIR/SERVICE
Repair and service terms were provided to the purchasing customer in the customer purchase agreement. All parts of the Repair and service terms apply to the purchasing customer and are non-transferrable.

RETURNS
Return terms were provided to the purchasing customer in the customer purchase agreement. All parts of the Return terms apply to the purchasing customer and are non-transferrable. All software sales or licenses are final, non-refundable, and/or non-transferrable.

Getting started

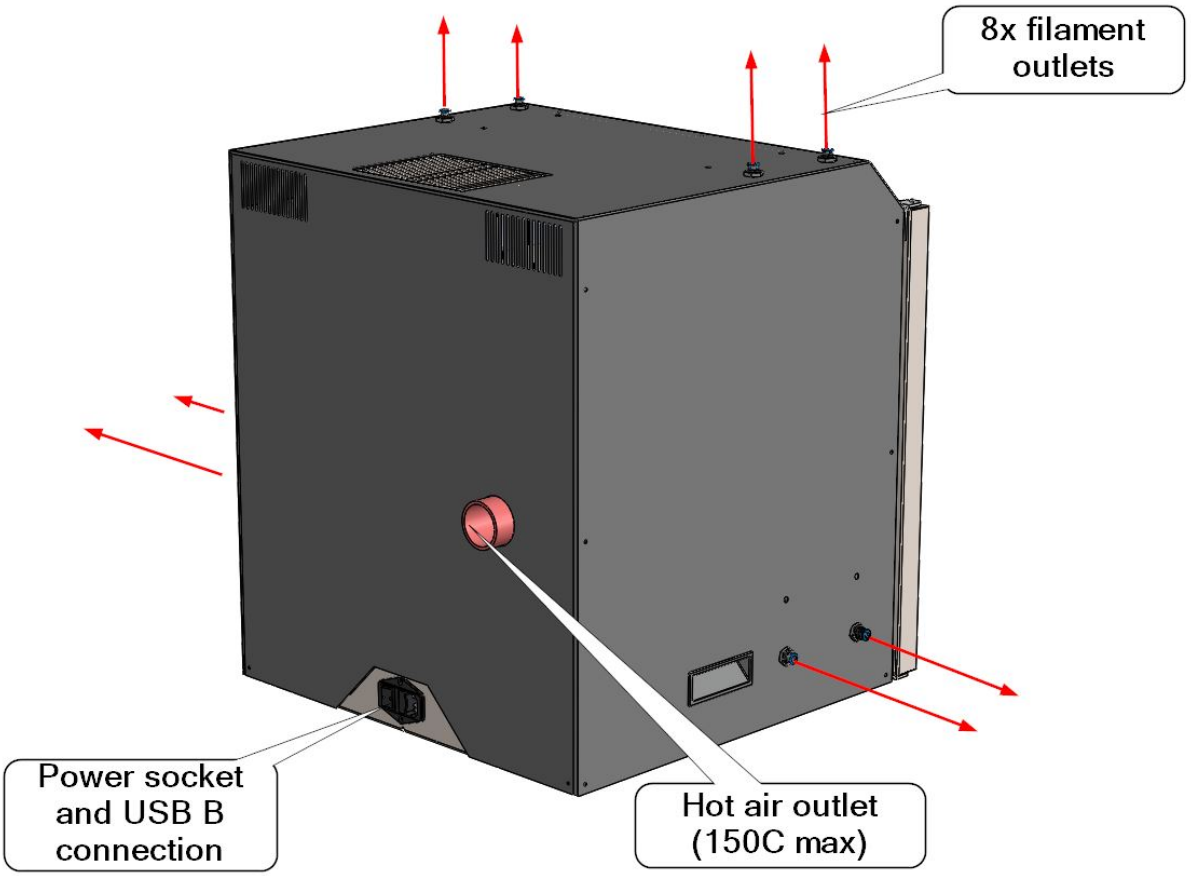
This chapter will guide and assist you during the initial setting up procedure of your Purpose Filament Dryer.

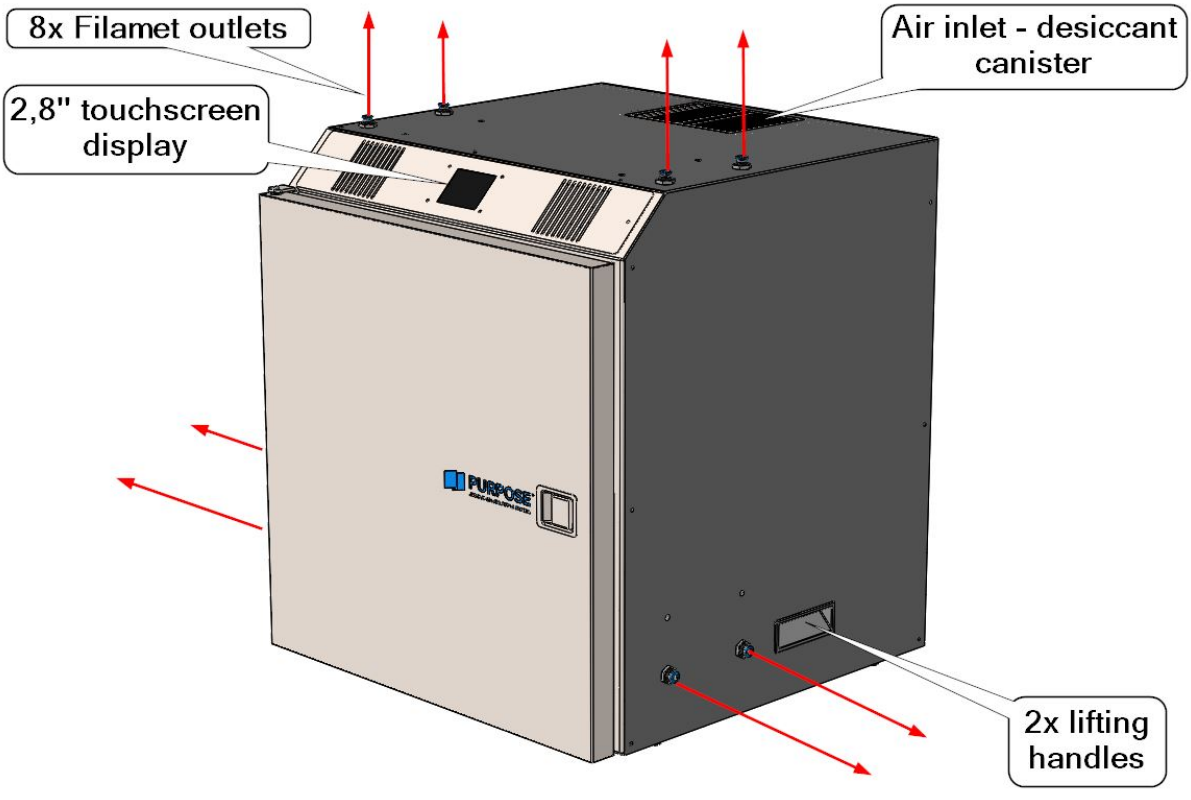
Accessory checklist:
Purpose Filament Dryer
Power cable
Filament guide tubes
User manual

Unpacking

1. Open the box containing your Purpose Filament Dryer and set aside the power cable and filament guide tubes.
2. Unwrap the Purpose Filament Dryer from its plastic bag and remove protective foils.
3. Suggested to move the dryer on the stable table by two persons lifting it from side handles or from bottom dryer part.
4. Warm to room temperature before using.

Filament dryer overview

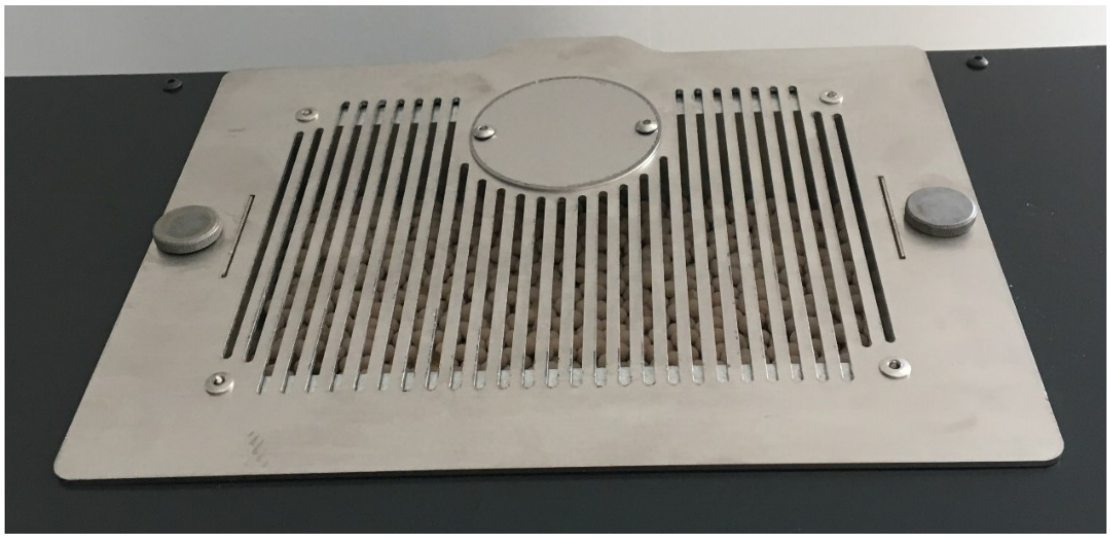

8x filament outlets
Power socket and USB B connection
Hot air outlet (150C max)


8x Filamet outlets
Air inlet - desiccant canister
2,8" touchscreen display
2x lifting handles

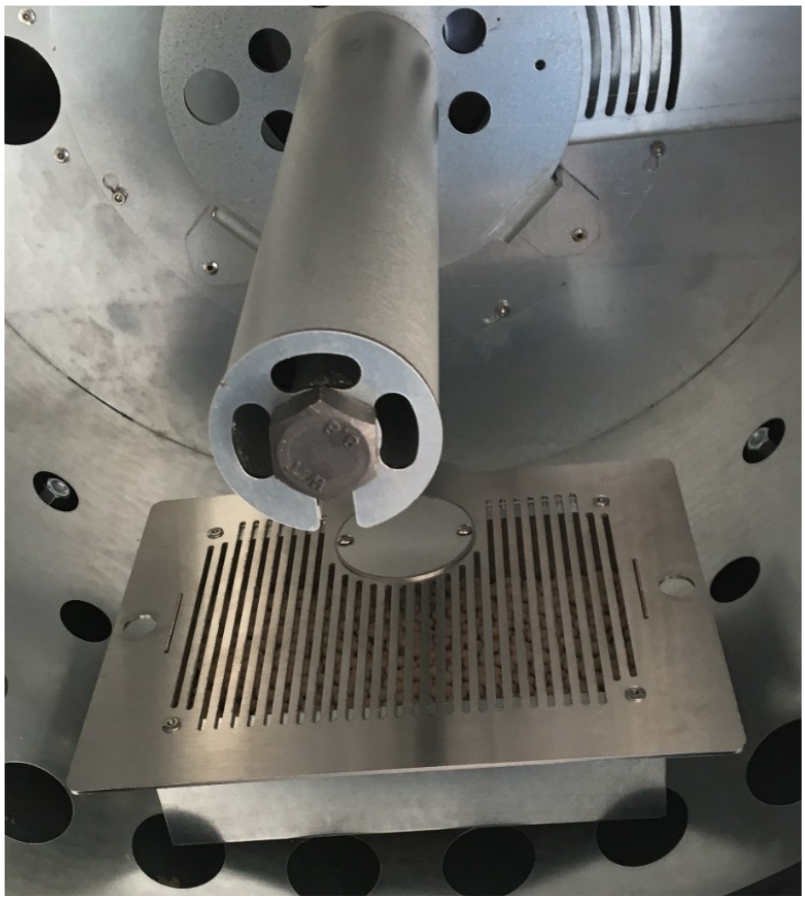
Initial dryer setup

1. Desiccant regeneration

1. While filament dryer is turned off unscrew 2 screws from the top part of desiccant module:



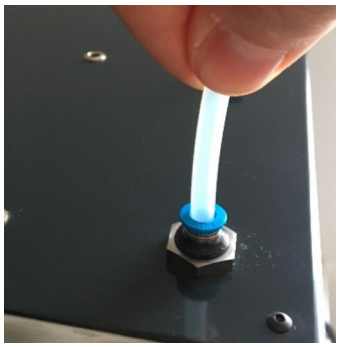
2. Insert desiccant module inside the drying chamber:



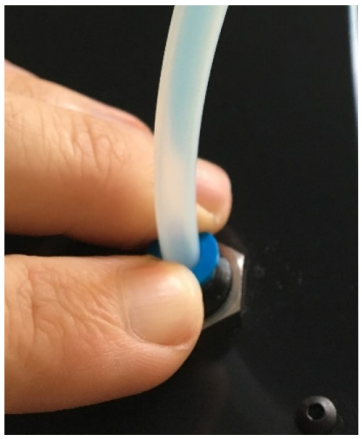
3. Close the chamber door, turn on the dryer on the back with power switch.
4. On the interface choose “Desiccant”->Start.
   Warning! Temperature in this process could go up to 150C so make sure that there is nothing else in the drying chamber.
5. Once regeneration finished allow to cooldown the desiccant module and then insert back in its place and fix it with two screws. Regeneration process is completed.

2. Dryer setup

1. Insert filament guide tube/-es in most optimal outlet/-s(8 options in total) once the tube is fixed:



To remove tube, press blue ring and take the tube out:



2. Put a 3D printing filament spool into the dryer. Make sure the spool has no packaging material around it.
3. Check the material of the spool. Common spool materials are ABS, PC, and PS. In many cases Spool material limits the maximum drying temperature. Please double check if choose drying temperature more than 80C.
4. Make sure the power switch on the back panel of the dryer is in the Off position.
5. Locate the power cable and plug it into the power input port at the back panel of the Purpose Filament Dryer .Plug the power cable into a power outlet of the Purpose Filament Dryer.
6. Plug the power cable into a power outlet of the Purpose Filament Dryer.
7. Switch the power on. You should see the software of the dryer starting up on the touchscreen. After a few seconds Home screen will appear. See Section Home screen to learn more about its functionality.

PRECAUTION
Always place the dryer on a stable horizontal surface, where it cannot fall or tip over accidentally.

PRECAUTION
The socket outlet must be located near the equipment and must be easily accessible.

PRECAUTION
Place the power cable so you can’t stumble on it, or step on it or otherwise expose to any damage. Make sure that the power cable is not mechanically or otherwise damaged. Stop using damaged cable immediately and replace it.

PRECAUTION
Note that the dryer is not suited for drying and feeding materials softer than 85A (Shore scale).

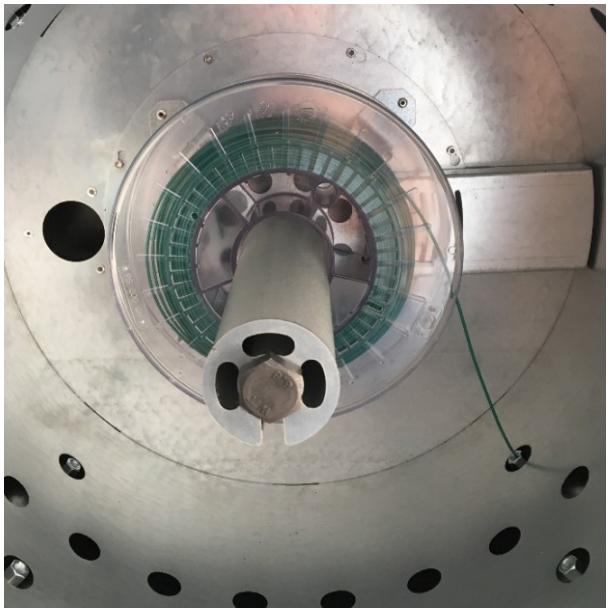
PRECAUTION

Keep free space from the back of the dryer, at least 30cm. Hot air is extracted from the dryer at the back! If possible connect dryer air output to heat resistant ventilation system.

Setting up dryer: standalone mode

The Purpose Filament Dryer is a standalone equipment for drying filaments used in most commercially available “open-material” 3D printers.

1. Select the drying setting on your Purpose Filament Dryer and begin the drying process (for that navigate to Home screen ->Drying->choose material->(optional) enable/disable Conditioning after drying stage is completed). Upon completion, the dryer will indicate that the process has been finished by an indication on the display. The dryer will switch to the conditioning mode if enabled previously to condition the dried material at constant conditions.
2. Insert the filament end in one of the outlets:



TIP: If insert more than one spool inside the chamber place it at opposite direction as previous spool to avoid filament tangling.

3. Feed the filament into your 3D printer according to the manufacturer’s instructions, and you are ready to start the first print with dried filament.

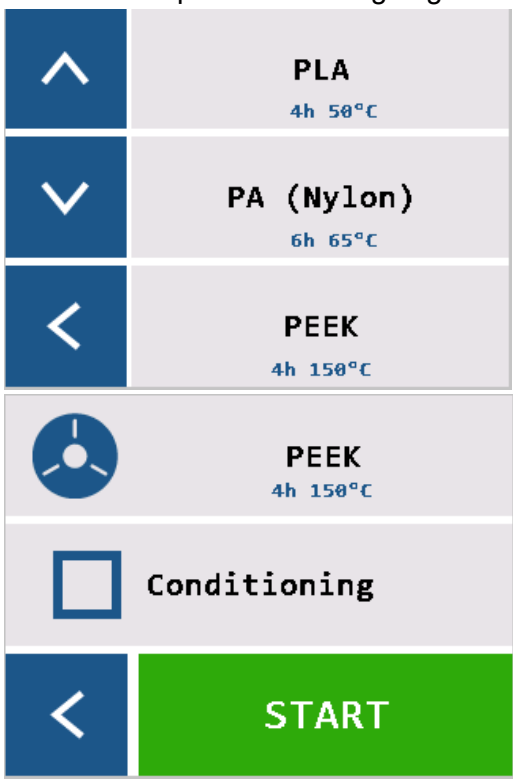
WARNING

During its operation the Purpose Filament Dryer can generate high temperatures. Wear heat protecting gloves when taking out hot filament spool out of the device.

Using the filament dryer

Home screen
From home screen is possible to access all necessary functionality of the dryer.

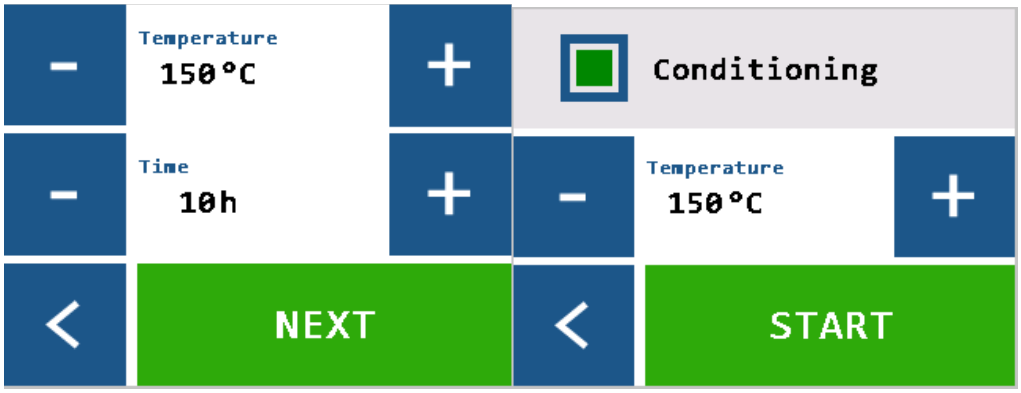
When pressing in the home screen **“Drying”** access the material preset list with most common material types. With navigation bar on the left side is possible to go through the material list up or down and going back to home screen with left arrow.



Once material is chosen there is an overview of the drying settings and possible to disable/enable conditioning (if enabled then after drying it will keep 40C in the chamber to keep it dry longer). When pressed Start button warming up will automatically started.

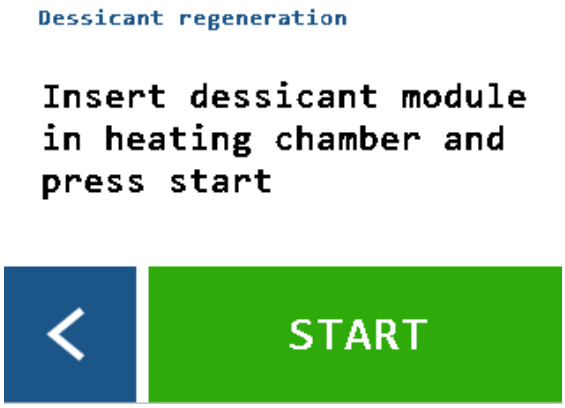
WARNING! Do not open the door while dryer is warming up or drying! Hot air can come out and heater will be disabled because there is a door switch which automatically sends a signal that the door is open.

Once pressed “**Custom”** button on home screen, the user can choose its own drying settings like drying temperature, time and conditioning temperature:

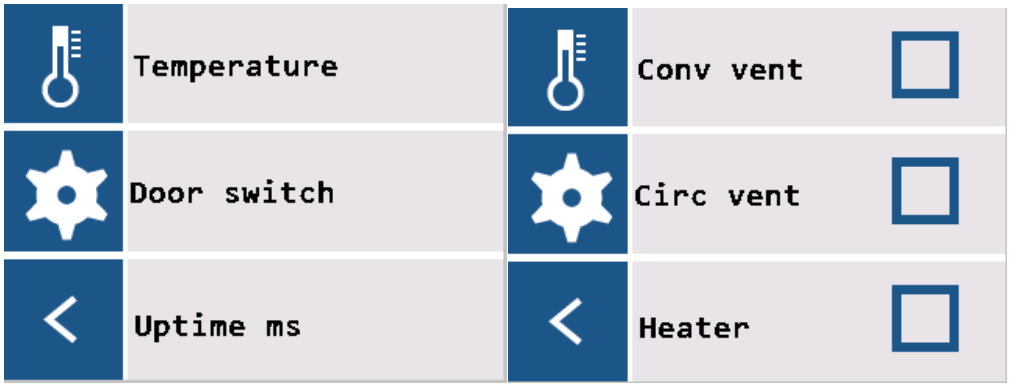


CAUTION
Use custom drying settings with care! Make sure filament and spool material can sustain the set drying temperatures.

In **“Desiccant”** screen is possible to start regeneration process, before pressing start please insert desiccant module inside the drying chamber as written previously in dryer setup procedure.



“Settings” screen is mostly for troubleshooting purposes to check, for example, temperature, if door sensor, heater, fans is working.



Drying process overview

After launching a drying procedure you will see a progress bar and process readouts displayed on the Status screen:

- The Progress bar displays the overall progress of the drying procedure.
- By pressing the STOP button you can cancel the procedure
- The Temperature field shows the air temperature in the drying chamber.
- The field Time left until preheating remaining counts down the time for the procedure to finish.

Maintenance

The dryer is designed to be maintenance free, however, regular visual inspections and checks for abnormal sounds must be performed to avoid unnecessary standstills of the machine.
Regularly check the machine for any defects.

Maintenance intervals:
Daily:

1. Check the machine for any visual defects.
2. Make sure there are no abnormal sounds coming out of the dryer.

Weekly:

1. Inspect the dryer chamber for dust buildup. If necessary clean it with vacuum cleaner.
2. Do the desiccant regeneration process.

Troubleshooting guide

Here is a short guide to some simple-to-fix problems which you may run into as you use your Purpose Filament Dryer.
For further assistance, please contact the Purpose Support team.

General problems

The Purpose Filament Dryer does not turn on
Check the cable connections and configuration, fuses position of the back of the printer should be up position:

Filament seems to be not dried, even though the drying process has been finished.
Perform the drying process once more or increase the drying time. You can increase the drying temperature as well, but make sure you know what you are doing. If that do not help please do desiccant regeneration process.

The Purpose Filament Dryer stopped due to a fault on the screen.
Please check the exact description and take measures accordingly. If the problem still persists, please contact our Support team.

During the printing process the feeder cannot feed filament, because it stuck in the Purpose Filament Dryer.
Open the filament dryer and ensure that the filament spool can move freely on the supports.
Check that the filament feeding tube is not twisted or bent.
Check that the reel is not melted or deformed; if so do not dry filaments on this spool material at such high temperatures.

Filament is tangled inside the Purpose Filament Dryer.
Open the dryer door and inspect the filament.
Untangle the filament or change spool to another one.

If you could not find an answer to your question, make sure to contact our Support Team; to help us to identify the problem please provide the following information:
Serial number of your Filament Dryer.
Software version (it can be found under the Utilities in Update screen).

Warning message displayed on the screen (if any).
Description of the issue.
Description of actions leading to the issue.
Your 3D printer type and model.

Frequently asked questions

Which 3D printing filaments should be dried?
ABS, PMMA, PA (Nylon), PC, PET, PETG, POM, TPU, PEEK, ULTEM, PEKK, 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.

What does determine the ability of a 3D printing filament to absorb moisture?
It depends on the polarity of the main polymeric component, i.e. its chemical nature.

What impact does moisture have on 3D printing process?
In the context of 3D printing high moisture content in the filament can give rise to the following 3D printing defects:
foaming, bubble formation, opaque appearance. At the polymer processing temperatures the water will evaporate, expand, and form bubbles in the polymer melt, which will result in bad surface properties and deteriorate the optical properties of the final parts;
more oozing and more strings. Water reduces the viscosity of the polymer melts, so they become more liquid;
pronounced warping. The prints from undried material usually show worse dimensional stability, and become more prone to warping;
bad interlayer adhesion, compromised mechanical properties. Due to the hydrolysis, the long macromolecule chains are split into shorter ones. This leads to the compromised mechanical properties of the solid parts, which can lead to the delamination during printing or even failure of 3D printed parts in service;
color changes. Hydrolysis products often lead to the color changes of the polymer.

What impact does drying have on the quality of 3D printed parts?
The main advantage of using dryers is that it will reduce the number of moisture-induced 3D printing defects. We have also observed that the parts printed with dried materials sometimes exhibit more accurate dimensions than the parts printed with undried material (see Figure below). So if the dimensional stability of your 3D printed parts is important, we strongly advise you to use a filament dryer. In general, the use of dryers increases the overall 3D printing success rate, and makes the 3D printing process more stable, thus, even enabling a continuous 3D printing.

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.

Why does filament drying take so long?
Moisture will not start to migrate out of the material until the temperature gradient across the filament is gone. As polymers are bad thermal conductors, it takes time for heat to penetrate to the centre of filament. Moreover, it takes even more time for the moisture to migrate to the surface. Exactly how much time it will take, depends on a number of factors including the specific type of polymer and the drying temperature.

How long does it take for a dried filament to regain moisture?
Moisture regain times vary greatly from filament to filament, and storing conditions. For some hygroscopic 3D printing filament under extreme cases (e.g. at high relative humidity conditions and very slow printing speeds) the moisture regain may be too rapid to avoid moisture-related printing defects, some other filaments can even be printed days after drying.

What are the main drying parameters?
The main drying parameters are temperature, air flow velocity, and drying time.

Terms and conditions

Terms
All information in this Manual is subject to change at any time without prior notice and is provided for convenience purposes only. Purpose reserves the right to modify, revise and edit this Manual at any time. You agree to be bound by any modifications and/or revisions made in this Manual by Purpose. Contact the Purpose Support Team.

DISCLAIMERS
Please note the following important disclaimers:
By purchasing our product you expressly understand that PURPOSE AM SYSTEMS Filament Dryers use an experimental technology, and that the PURPOSE AM SYSTEMS Filament Dryers are solely intended for use under the guidelines provided in the user manual and this agreement. You understand and acknowledge that this Manual only describes the best practice for operating PURPOSE AM SYSTEMS Filament Dryers, and that even the best practice for operating the filament dryer is not always presumed as safe.

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