

# ZMORPH FAB

## MANUAL GUIDE

# Table of content

---

1. Manual guide.....	6
1.1 Introduction.....	6
1.2 Markings contained in the instructions guide and on the device .....	6
2. Health and safety at work .....	7
2.1 General safety information .....	7
2.2 Occupational hygiene .....	8
2.3 Electrical safety and risk.....	8
2.4 Safety and mechanical risks .....	9
2.5 Risk of burns.....	9
2.6 Instructions for safe storage and transport .....	9
2.7 Electromagnetic compatibility (EMC) .....	11
2.8 Laser radiation.....	11
3. Manufacturer's warranty and liability.....	12
3.1 Scope of the warranty .....	12
3.2 Acceptance of warranty claim.....	13
3.3 Claim processing period .....	13
3.4 Zmorph's liability .....	14
4. Certificates .....	15
5. What is Zmorph Fab .....	16
6. How to use your Zmorph Fab 3D printer.....	17
7. Sets .....	19
7.1 Types of sets and their content .....	19
8. Machine specification.....	20
8.1 Overview.....	20
8.2 Components .....	22
8.3 Functionalities.....	24

# Table of content

---

8.4 Technical specification .....	25
<b>9. Setting up Zmorph Fab.....</b>	<b>28</b>
9.1 Location requirements .....	28
9.2 Safety features removal.....	29
9.3 Assembling the spool holder .....	29
9.4 Assembling the HEPA filter .....	30
9.5 First use .....	32
<b>10. Maintenance .....</b>	<b>33</b>
10.1 Toolheads maintenance .....	33
10.2 Changing worktable .....	37
10.3 Removing covers .....	38
10.4 How to change the filter cartridge.....	41
10.5 Communication and File Delivery .....	42
<b>11. Voxelizer.....</b>	<b>45</b>
11.1 Installation and system requirements .....	45
11.2 Files maintenance and preparation.....	46
11.3 Presets .....	48
<b>12. 3D printing workflow.....</b>	<b>50</b>
12.1 Toolheads .....	50
12.2. 3D printing materials .....	52
12.3 Loading the filament .....	53
12.4 Removing the filament.....	57
12.5 Material exchanging.....	59
12.6 Filament replacement during printing .....	63
12.6 Automatic detection of missing filament .....	65
12.7 Autocalibration.....	68

# Table of content

---

12.8 Manual calibration process .....	74
12.9 Calibration - additional functions .....	75
12.10 Preparing the worktable .....	77
12.11 Files preparation .....	78
12.12 Starting the print .....	101
12.13 Editing parameters during printing .....	102
12.14 Pause and resume printing .....	104
12.15 Abort Printing .....	104
12.16 Removing a printout from the platform .....	105
12.17 Support material removal.....	105
12.18 Hibernation.....	106
<b>13. CNC milling workflow .....</b>	<b>107</b>
13.1 CNC Milling Toolhead.....	107
13.2 Materials compatible with CNC Milling Toolhead.....	108
13.3 Material fixturing.....	108
13.4 Milling cutter fastening .....	111
13.5 CNC milling file preparation .....	112
13.6 CNC milling file starting (with calibration).....	124
13.7 Tool changing process.....	127
13.8 CNC Milling Toolhead safety rules.....	128
<b>14. Laser cutting and engraving workflow .....</b>	<b>131</b>
14.1 Laser Toolhead .....	131
14.2 Materials compatible with Laser Toolhead .....	132
14.3 Material fixturing.....	132
14.4 Laser engraving file preparation.....	135
14.5 Laser engraving/cutting file starting (with calibration) .....	141

# Table of content

---

14.6 Laser Toolhead safety rules .....	144
<b>15. Thick Paste Extruding .....</b>	<b>148</b>
15.1 Thick Paste Extruder Toolhead .....	148
15.2 Materials .....	149
15.3 Thick Paste file preparation .....	149
15.4 Material application.....	152
15.5 Thick Paste file starting (with calibration) .....	154
15.6 Thick Paste Extruder Toolhead safety rules .....	155
<b>16. Machine maintenance and operation .....</b>	<b>156</b>
16.1 Basic maintenance.....	156
16.2 General procedures.....	157
16.3 Worktable procedures .....	158
16.4 3D printing toolhead procedures.....	159
16.5 X,Y,Z axes procedures .....	160
<b>17. Spare parts .....</b>	<b>161</b>
<b>18. Firmware upgrades .....</b>	<b>162</b>
18.1 General informations .....	162
18.2 Updating firmware .....	163
<b>19. Help and support .....</b>	<b>165</b>
19.1 Support request .....	165
19.2 Troubleshooting.....	166
19.3 Handy resources .....	169

## 1. Manual guide

### 1.1 Introduction

This manual describes the basic information about Zmorph Fab, safety precautions, preparation for operations and basic maintenance. Read this manual guide thoroughly before operating the device for the first time. Ignorance of the instructions may result in damage to the device, personal injury or reduced quality of the printed parts. Make sure that everyone who uses the device has read and followed these instructions. The manufacturer of the equipment makes every effort to ensure that the safety of use, transport, storage and disposal is at the highest level. However, the manufacturer has no direct control over the user and the use of the device, therefore he is not liable for injury, damage and costs resulting from non-compliance with these instructions.

### 1.2 Markings contained in the instructions guide and on the device



**Moving parts hazard** - to avoid injury or damage to parts of the body, do not reach inside the unit or insert any foreign objects while the unit is in operation, during operation or at rest.



**High voltage** - this symbol indicates the area where the user may be electrocuted.



**Hot surface** - this symbol warns of high temperatures to avoid burns.

**ZMORPH**

Name: All-In-One 3D Printer  
Type/model: Zmorph FAB  
AC: 110-240V, 50-60Hz

Serial number: 1001/FAB  
Max power output: 350W  
Produced: 2020  
Weight netto: 20kg  
Made in Poland

Caution! The removal of the bottom plate may result in loss of warranty.



Zmorph Fab Nameplate

## 2. Health and safety at work

### 2.1 General safety information

This manual contains warnings and safety information for your Zmorph product. The manual also indicates situations to which special attention should be paid, and warnings about misuse or neglect of the device. It is also important to read the material safety data sheets available at the address: [zmorph3d.com](https://zmorph3d.com). Regular updating of the firmware is also important to prevent defects and damage. To keep track of the latest instructions and software updates, it is recommended that you visit the site [support.zmorph3d.com](https://support.zmorph3d.com) regularly. Place the unit on a level and clean surface. The device must be secured against overturning, falling from a height or being knocked down by people moving in the vicinity.

- Zmorph Fab Multitool 3D Printer generates very high temperatures during operation, and has easily accessible moving parts. Caution is advised.
- When operating the printer, avoid situations that could cause burns or interfere with the proper functioning of the device.
- Due to their size and specificity, Zmorph devices are not intended for use by children under 14 years of age and persons with reduced manual, motor and psychomotor skills. If the device is operated by handicapped or elderly people, the Manufacturer recommends using assistance or supervision of appropriately trained persons.
- Do not leave the device unattended during operation, especially when working with the Laser Toolhead.
- Periodically check the condition and functionality of the 3D printer to avoid potential malfunctions.
- Switch off the device after finishing work.
- Regularly check the wear and tear of parts in the machine. The list of spare parts can be found in the [spare parts](#) section.
- For assistance with technical problems and any maintenance work, please contact the Technical support at the following address: [support.zmorph3d.com](https://support.zmorph3d.com)
- Keep the unit away from heat sources, flammable materials, equipment emitting radiation, moisture, water and other liquids.
- Before starting work, ensure that the device is out of reach for children and animals.
- Be careful not to drop, hit or shake the device.
- This device is not intended to operate in a potentially explosive atmosphere.
- For detailed information on the safety of devices with different toolheads, please refer to the separate chapters.

# Health and safety

---

## 2.2 Occupational hygiene

- Special care must be taken when carrying out a repair, maintenance or servicing operations. The user is exposed to high temperatures. Protective gloves are recommended.
- Even with the HEPA and carbon filtration system it is recommended that a dedicated space with adequate ventilation is provided for the device. It is not recommended that you stay in the same room where the device is working continuously.
- Fumes emitted during 3D printing or laser engraving can be hazardous, depending on the material used. Some substances, in combination with accumulated dust, can have a negative effect on people in long-term exposure.
- The noise emitted when working with 3D printing toolheads is 45 dB and when milling is less than 70 dB, but continuous presence in one room can cause discomfort to the user.
- Place the device on a stable and flat surface.
- The device is equipped with a vibration-damping base.
- Follow the toolhead cable descriptions while connecting them to the machine and do not connect devices that are not authorized by the manufacturer.
- Do not use materials that may damage the device or that are not authorized for use with the toolheads.
- When using Zmorph Fab, ensure all necessary health and safety measures as described in this manual and separate regulations.
- Handle the sharp accessories and tools included with the kit with special caution.

## 2.3 Electrical safety and risk

Zmorph Fab devices have been tested to comply with the Low Voltage Directive. In order to ensure maximum safety of use, including protection against short circuits, overloads, overvoltages and overheating of the product, the following provisions must be observed:

- Do not modify the machine, toolheads and its electronic components.
- Do not use electronic substitutes other than those recommended by the manufacturer.
- Replacement of electronic components should be done in accordance with the recommendations and instructions provided by the manufacturer.
- Before connecting the 3D printer to the power outlet, make sure that the voltage required by the device corresponds to the voltage available from the power source. For power supply information, refer to the nameplate on the rear of the device.
- Avoid overloading the power outlet to which the 3D printer is connected.



# Health and safety

---

- The device must be properly grounded. Always make sure that the grounding is in accordance with local and national regulations.
- Use only the original power cord or one authorized by the manufacturer. It must not be destroyed, cut or repaired. Replace a damaged cable immediately with a new one.
- Perform repair and maintenance work on the device when it is disconnected from the power supply.
- Do not expose the device to moisture or modify electronic components (e.g. soldering).

## 2.4 Safety and mechanical risks

The device includes moving parts such as toothed belts, gears, motors, toolheads and a worktable. In order to ensure maximum safety for the operator and the device follow these precautions:

- Do not reach inside the unit or insert any foreign objects while the unit is during operation.
- Use the accessories supplied with the unit for their intended purpose and take special care when handling them. Their improper use may cause personal injury.
- Special care must be taken when removing the printout from the worktable and protective glasses should be worn, as there is a risk of fragments of the material scattering towards the eyes.

## 2.5 Risk of burns

There is a high risk of burns, as the temperature of the extruder can be as high as 250°C. Do not touch the toolhead with bare hands and use caution when operating hot components. If it is necessary to hold a hot item, use specially adapted pliers and/or tweezers. The hot components should not take more than 30 minutes to cool down. The temperature of the worktable can reach even 115°C, therefore, special care should be taken during use, in particular when performing operations or removing the finished printout. Do not underestimate the risk of burns on the device. In addition, design modifications to the device with respect to changes in operating temperature are not permitted, as they may result in serious injury or permanent damage to the printer.

## 2.6 Instructions for safe storage and transport

- Store Zmorph Fab devices at -10 to 40°C.
- The storage place should be free from moisture and extreme weather conditions.

# Health and safety

- During storage, the devices should be oriented in a vertical position with the top facing the direction marked on the box:



- When stored in original packaging, a maximum of 30 kg of weight can be placed on a single package.
- Recommendations for packing:
  - To transport the device, it is best to protect it with original protective foams; in case of lack of original foams, the device should be protected in such a way that free movement of the device in the transport packaging is not possible.
  - Secure all moving components (toolhead with X-carriage and worktable with Y-axis) in such a way that they cannot be moved during transport.
  - In particular, the glass plate of the worktable should be kept in mind, as it can slide out of the mounting clips during transport. Make sure that it is secured against ejection.
- Recommendations for transportation:
  - When placing several devices on a pallet, observe the markings on the packaging:



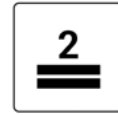
Protect against moisture.



Careful, fragile - a load that can easily be broken.



Do not roll.



Stack up to two packages one on top of the other.

- The weight of one device with toolheads is approximately 30 kg.
- It is recommended to safely store the devices on a pallet, but not more than 1.0 m high.
- One pallet (standard size 1200 x 800mm) can hold up to 4 devices.
- Remember that the edges of the packaging should not protrude beyond the outline of the pallet. Devices placed in this way on a pallet should be properly packed, bound and then wrapped with foil.
- At least two people must be involved in loading and unloading one machine. The packaging should be lifted by the designated handles on its sides

## 2.7 Electromagnetic compatibility (EMC)

Every Zmorph device is electromagnetically compatible in accordance with the EMC directive. It was tested in laboratory conditions meeting the standards of the European certificate of conformity. Its operation meets the following conditions in accordance with the EMC Directive:

- this device (system) does not cause harmful interference to other devices (systems),
- this device (system) is not sensitive to interference from other devices (systems),

## 2.8 Laser radiation

The Laser Toolhead supplied with Zmorph Fab is a Class 4 laser with a power of 2.8 Watts and an emitted wavelength of 450 nm. Such lasers are extremely dangerous and emit visible and invisible radiation. Diffuse radiation is dangerous for the eyes and skin. Materials evaporated from the surface of illuminated objects are a potential hazard. Depending on the material used, toxic fumes may occur affecting the respiratory tract and eyes of the user. In order to use the Laser Toolhead, the user should be familiar with the principles of safe use (chapter 14.6).

## 3. Manufacturer's warranty and liability

Zmorph Fab Multitool 3D Printer is designed to be modular and easy to service. In case of technical difficulty with any parts, it can be easily removed and shipped to manufacturer for maintenance.

### 3.1 Scope of the warranty

**3.1.1** Guarantor is only liable for the physical defects resulting from the inherent causes in the sold product.

**3.1.2** Duration of the warranty starts at the date of purchase of the product by the initial Buyer. The Date of Purchase is the date specified in the sales invoice. The warranty period of the repaired product is extended by the time which was required to repair the product (which includes the time from the delivery of the defective product with the complete warranty claim until the date of returning the repaired product to the Customer).

**3.1.3** Warranty does not cover defects resulting from other causes than indicated in clause 3.1.2, especially any defects resulting from:

- a) improper use or application of the product;
- b) improper product selection for the existing installation site conditions;
- c) improper or inconsistent with User Guide installation (including improper connection to the main power supply), maintenance, storage or transport;
- d) mechanical, chemical or thermal damages;
- e) deliberate product damages;
- f) damages ensuing as a result of non-original or inconsistent with Zmorph's recommendations or with the User Guide product use;
- g) random events;
- h) factors being result of major force, random events or any other external factors;
- i) use of non-original parts or consumables;
- j) modifications, repair attempts, interference in the product carried out by any other person than Zmorph representative or other representative authorized by Zmorph to carry out any of the above mentioned actions;
- k) continued usage of the product despite occurrences indicating an obvious defect;
- l) improper transport methods provided by the Customer;

# Warranty and liability

---

**3.1.4** The warranty does not apply to the consumable parts (such as nozzle, PTFE tube, jagger, toothed belts, glass part of the table, bearing, filter) unless failure has occurred due to a defect in materials or manufacture.

**3.1.5** The warranty shall cease to apply in the event of:

- a) any product modification by any person not authorized by Zmorph;
- b) any repair attempts of product by any person not authorized by Zmorph;
- c) other interference in the product carried out by any person not authorized by Zmorph.

**3.1.6** The warranty service does not apply to the actions stipulated in the User Guide which the user is obligated to perform on their own and at their own expense.

**3.1.7** The warranty applies without territorial restrictions.

## 3.2 Acceptance of warranty claim

**3.2.1** The warranty claims may be accepted either at the shop where the product was purchased or at the authorized service or at Zmorph's registered office

**3.2.2** Acceptance of warranty claim requires:

- a) returning a completed warranty claim during a warranty period to the Service Center;
- b) including the name of the product, the date of purchase, a detailed description of the damage, as well as the description of the defect in the warranty claim;
- c) attaching the original proof of purchase to the warranty claim;
- d) delivering the defective product to Zmorph's registered office at the Customer's expense.

## 3.3 Claim processing period

**3.3.1** The Service Team shall repair the defective product within 14 working days from the date of delivery of the defective product with the complete warranty claim to the correct Service Center.

**3.3.2** The claim processing period may be extended by the time necessary to import the required replacement parts of the product. In all cases the Customer shall be informed on the extended claim processing period.

# Warranty and liability

---

## 3.4 Zmorph's liability


**3.4.1** Zmorph is not required to modernize or modify the existing products after launching their new versions.

**3.4.2** Zmorph shall not be liable for any damages incurred by the Buyer due to the defect of the product, especially damages related to damage of other devices, loss of potential benefits or cost of replacement of the product. The clause shall not apply to the Buyer who is a Consumer.

**3.4.2** The warranty does not waive, restrict or suspend any rights of the Buyer who is a Consumer due to the product being non-compliant with the contract.

3DPE.ir/academy

## 4. Certificates



**ZMORPH**  
3D PRINTERS  
THAT DELIVER

zmorph3d.com

### UE/EC DECLARATION OF CONFORMITY

Manufacturer/address:  
**Zmorph S.A.**  
**A. Ostrowskiego 9, 53-238 Wrocław Poland**


Object of the declaration:  
**Personal fabricator**  
**Type/model: ZMORPH FAB**

Object of the declaration described above is in conformity with the directives:  
**EMC 2014/30/UE; RoHS 2011/65/WE; LVD 2014/35/UE; MAD 2006/42/WE**

The object also is in conformity with the relevant community harmonisation legislation:  
**PN-EN 55011:2016-05; PN-EN 61000-3-3:2013:10; PN-EN 61000-4-2:2011; PN-EN 61000-4-3:2007+A1:2008+A2:2011; PN-EN 61000-4-4:2013:05; PN-EN 61000-4-5:2014-10; PN-EN 61000-4-6:2014-04; PN-EN 61000-4-11:2007; PN-EN 61000-4-11:2007; PN-EN 61000-3-2:2014-10; PN-EN 55011-1:2012 group 1; PN-EN 55011-:2012 class B; PN-EN 61000-3-3:2013; PN-EN 61000-3-2:2014-10; PN-EN 61000-4-4:2013; PN-EN 61000-4-3:2007; PN-EN 61000-4-6:2009; PN-EN 61000-4-5:2014; PN-EN 61000-4-11:2007.**

The declaration was issued as a result of the conformity assessment procedure conducted with the directives.

Confirmed by the sign:



Independent laboratory tests were conducted.


**Any change made to this device will void this declaration.**

**It is forbidden to use the device against its intended use.**

**This declaration of conformity is issued under the sole responsibility of the Manufacturer.**

The technical documentation is kept at the Manufacturer address.

Wrocław 29.10.2020


---

Maciej Nawrocki

**Zmorph S.A.**  
A. Ostrowskiego 9, 53-238 Wrocław, Poland  
NIP: 899-274-32-04 | KRS:0000724021  
+48 71 33 68 923 | contact@zmorph3d.com

# What is Zmorph Fab

---

## 5. What is Zmorph Fab

The Zmorph Fab product is a multitool 3D printer. It has a system of interchangeable tool-heads, designed to perform 3D model prints in Fused Filament Fabrication (FFF) technology, CNC milling, and laser engraving and cutting. Zmorph Fab together with Voxelizer software provides a complete environment for moving 2D and 3D projects from monitor screen to reality. The device can operate independently or with an external computer on which the control software is installed. In this case, a USB connection or LAN connection is required. The control software is available on the manufacturer's website [voxelizer.com](http://voxelizer.com). The device is equipped with a built-in touch screen LCD panel which serves as a graphical interface for operation in standalone mode. The LCD panel has a port for SD cards on which it is possible to deliver ready-made executive files (G-code files). Files can also be sent to the device's internal memory via a computer.

Zmorph Fab can be used with many different materials, such as: plastics (PLA, ABS, TPE, PET, HIPS, PVA, Nylon), wooden and wood-like materials (plywood, fiberboard), PCB, acrylic, aluminum, thick masses (chocolate, cream).

Due to the closed working area, the machine can be used for more demanding materials, e.g: ABS and Nylon. Closed covers ensure a constant temperature of the working space, thus creating a working atmosphere that prevents the occurrence of adverse phenomena such as: shrinkage of material, delamination, surface deformations. If you use materials that require faster cooling, the special magnetic design of the lid hinges allows for quick and easy disassembly.



## 6. How to use your Zmorph Fab 3D printer

Working with Zmorph Fab starts by preparing a 3D model in a modeling software that supports files in one of the standard formats .stl, .obj, .step, .dxf or delivering a finished model acquired from external sources.

Then, the model has to be opened in a software dedicated by the manufacturer called Voxelizer. It allows you to manage 3D printing, CNC milling and laser engraving. It is a unique original application for slicing 3D models into layers, creating a whole chain of processing 3D files into G-code files and sending them to the device. The program allows you to perform simple editing operations and optimize models using 3D filters and intelligent system of support structures. Voxelizer also has advanced algorithms such as projecting an image onto a 3D object, allowing multi-material printing of images from .png and .bmp files.

After selecting the parameters and generating the G-code file, it should be saved. This file can be delivered to the device using an SD card or imported to an internal memory using a USB connection. You can also transfer a file via Ethernet, but the transfer process will be slower. To avoid the risk of data transfer interruption, it is recommended to use an SD card.

Alternatively, other software can be used to generate G-code files, but they do not fully take advantage of the capabilities of the Zmorph Fab device and do not provide the support for CNC and Laser toolheads. After the finished file in G-code format has been delivered to the device, it can be started by using the touch panel on the device, or by connecting to the device via Ethernet cable. It can be started directly from the Internet browser on the computer.

The product is intended for indoor use only. The device is not protected against moisture and has no air filters. The spaces in which the device operates must be dust free, dry and well ventilated. When working with plastics (e.g. ABS, Nylon), harmful fumes can be released.

# How to use Zmorph Fab

---

## Unauthorised uses

- It is forbidden to operate the device near flammable substances.
- It is forbidden to install the device outside areas which are dry and free from humidity or dust.
- It is forbidden to cover the device with any material during operation.
- It is forbidden to leave the device running unattended when working with the Laser Toolhead.
- It is forbidden to install or service the device by unqualified persons.
- It is forbidden to interfere with the constructional solutions of the product.
- It is forbidden to connect the machine to a faulty power supply system.
- It is forbidden to connect the device to the a power outlet without grounding.
- It is forbidden to insert hands or any body parts between moving parts.
- It is forbidden to touch heated elements during operation.
- It is forbidden to use the device without the required protective equipment.
- It is forbidden for untrained personnel to operate the device.
- It is forbidden to use a damaged device.

## 7. Sets

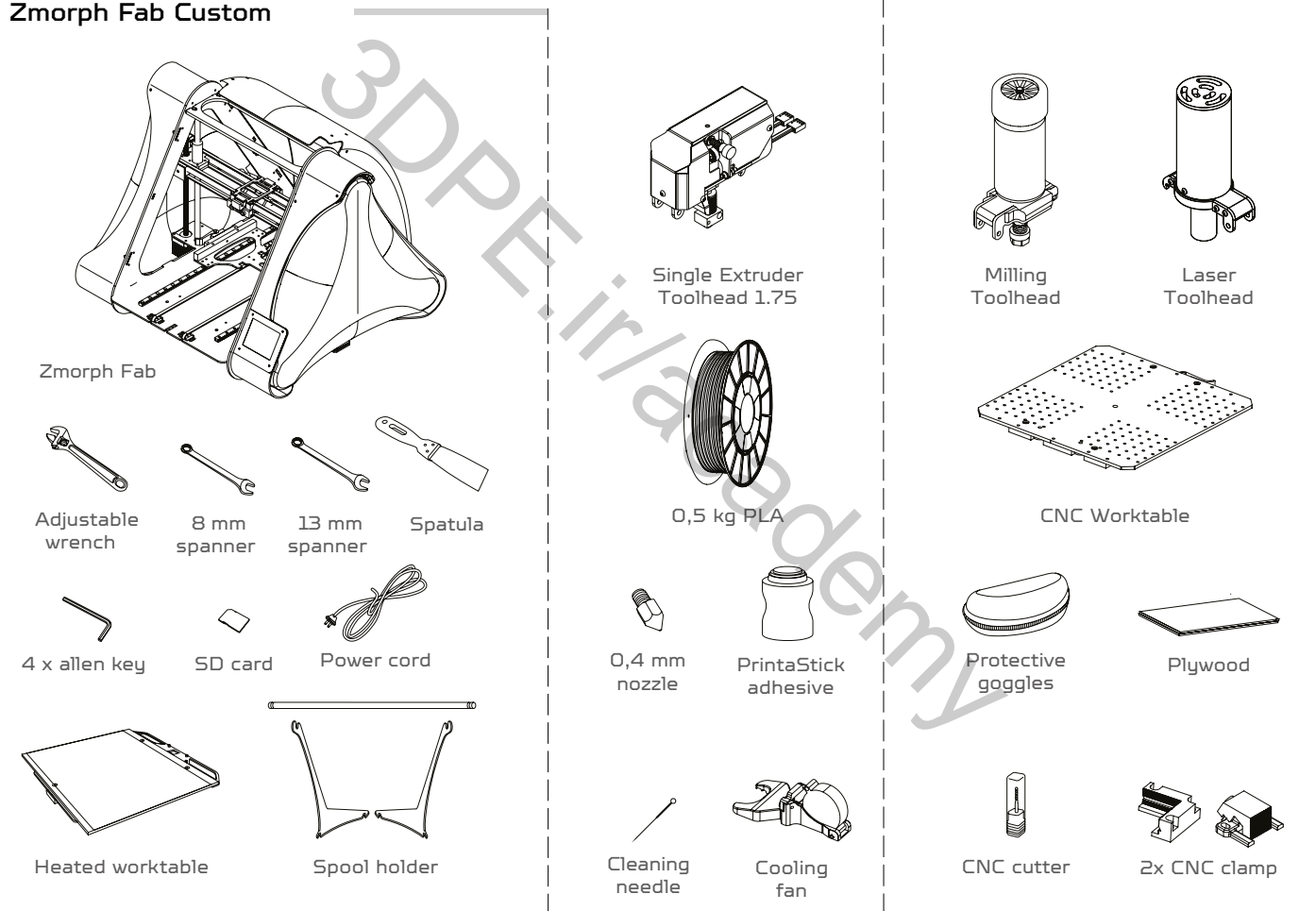
### 7.1 Types of sets and their content

What's in the box:

Zmorph Fab All-in-One

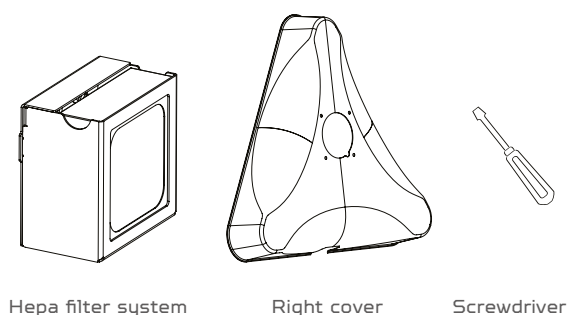
Zmorph Fab 3D printer

Zmorph Fab Custom



Additional accesories:

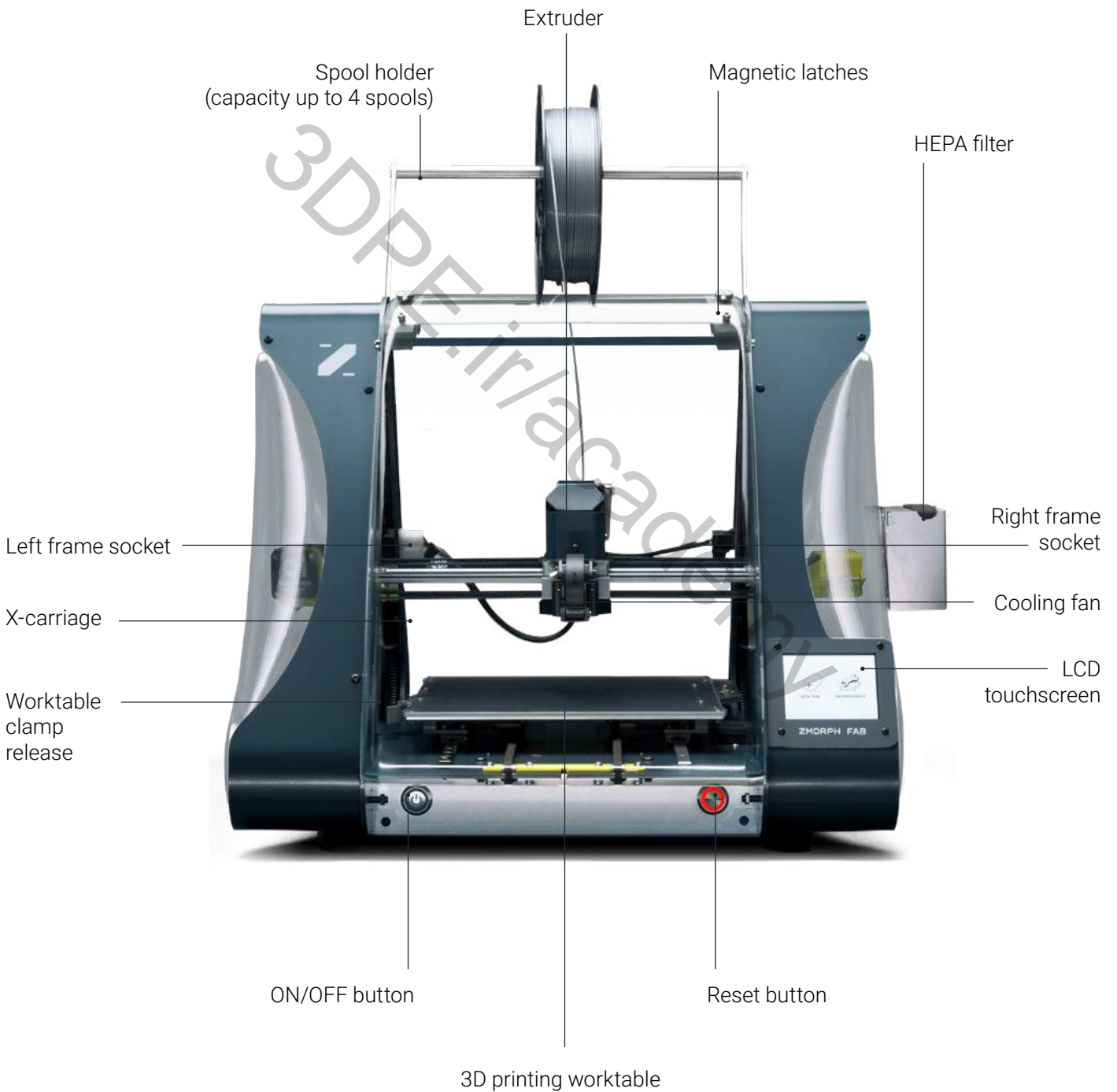
Zmorph Fab can be upgraded with HEPA filtration system. HEPA filtration system can be send along with the machine and with already installed right cover or it is possible to order it separately.



# Machine specification

## 8. Machine specification

### 8.1 Overview



# Machine specification

---



Internal memory card

USB socket

Ethernet socket

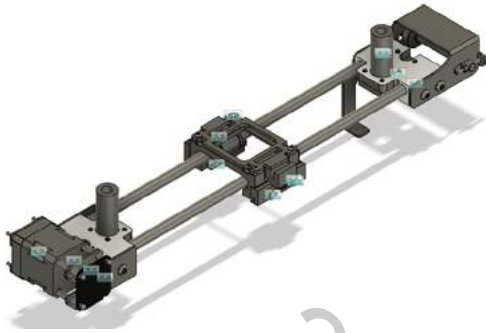
Zmorph Fab Nameplate

Power cord socket

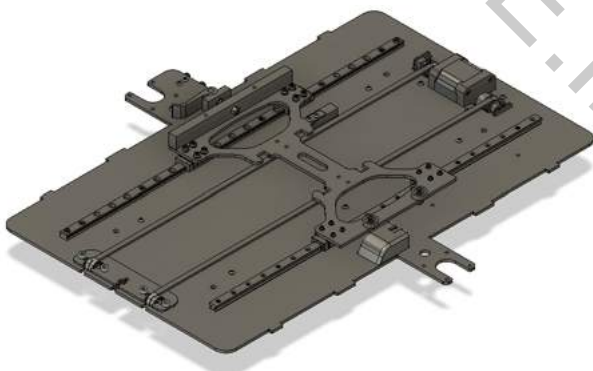
# Machine specification

---

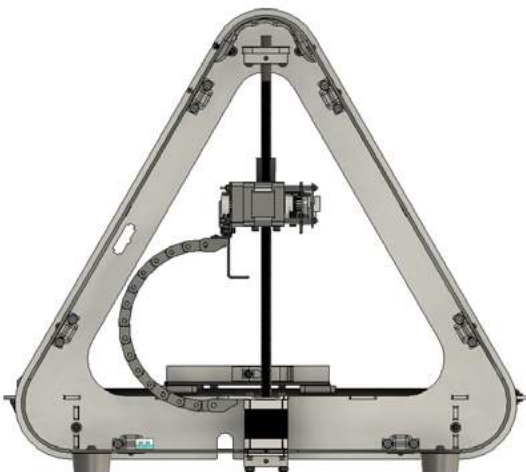
## 8.2 Components



X-axis - double-toothed belt system driven by a stepper motor and stainless steel rods as guiding elements. Used for movement of the Zmorph Fab toolhead. Must be periodically lubricated to ensure a long life of the machine.



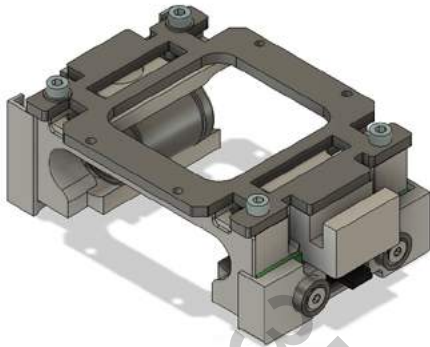
Y-axis - double-toothed belt system driven by a stepper motor and hybrid (linear/sliding) rails as guiding elements. Used for movement of Zmorph Fab worktable. Must be periodically lubricated to ensure a long life of the machine.



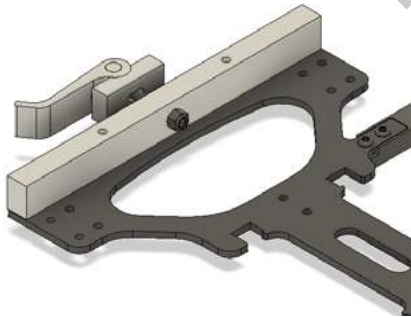
Z-axis - axis driven by double stepper motors with integrated trapezoidal screws and high-quality POM trapezoidal nuts. Guiding elements are stainless steel rods and linear bearings. Used for movement of X-axis of Zmorph Fab machine. Must be periodically lubricated to ensure a long life of the machine.

# Machine specification

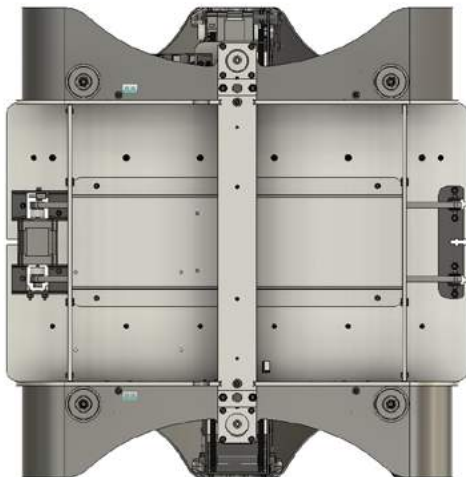
---



X-carriage/Toolhead mount - element responsible for holding down toolhead, as well as automatic calibration. X-carriage has linear bearings mounted that slide on stainless steel rods and is also a housing for a calibration element - strain gauge. Toolhead mounting is described in **10.1 part** of this manual.



Y-carriage/Worktable fixation system - specially designed lever and magnets system for quick and effortless changing between additive and subtractive work surfaces. worktable changing is described in **10.2 part** of this manual.



The bottom cover of the machine - responsible for the protection of the motherboard and power supply from external damage and dirt. Allows air exchange for cooling internal electronics.

# Machine specification

---

## 8.3 Functionalities

- Magnetic detachable covers - fully transparent covers allow for a clear, not obstructed view of Fabrication processes. For easy cleaning and maintenance of the machine, covers can be removed thanks to the magnetic mounting system. Covers removal is described in 10.3 part of this manual
- External spool holder - designed for reliable filament unwinding during the 3D printing process. Mounted on the back of the machine doesn't obstruct filament path and doesn't take any additional space on your desk. Spool holder mounting is described in 9.3 part of this manual.
- Closed-Loop System - controls the current position of the toolhead in X and Y axes. Whenever detects the difference between the real and theoretical position of the toolhead, applies a correction algorithm to ensure the best quality of Fabrication. It is also used as a protection system in case of severe positioning problems (like blocked tool-head).
- Toolhead changing system - quick and repeatable method for mounting different Zmorph toolheads. Properly mounted toolhead will ensure high-quality Fabrication whether it is additive or subtractive manufacturing. Toolhead change is described in 10.1 part of this manual.
- Platform leveling - to ensure proper first layer adhesion your printing bed must be leveled. Zmorph has developed special software and mechanical solution to make the leveling process easy and reliable. There are both automatic and manual calibration methods available. Calibration methods are described in 12.7, 12.8, 13.6, 14.4, 15.5 parts of this manual. Please remember that automatic calibration is available only for 3D printing toolheads.
- Filament change - an additional feature that can be performed during printing with both single and Dual Extruder Toolhead. Allows for easy change of material to achieve either multi-colored or even multi-material models.
- Hibernation - a special software feature that allows to turn off the machine. During hibernation toolhead position is saved and later restored upon booting machine again.
- Filtration system - HEPA and Carbon filtration system, stops most air pollutants released during machine operation.
- Material sensor - ensures the continuity of the material flow in the Single Extruder Toolhead 1.75. When material shortage is detected the machine stops and pause the printing process and turns on the filament change mode.
- Smart toolheads system - whenever the machine detects a change in the toolhead cable connection it will automatically assist the user in the changing process and detects the correct toolhead.



# Machine specification

## 8.4 Technical specification

### Weight and Physical Dimensions

Machine dimensions without the spool holder	520 x 500 x 450 [mm]
Machine dimensions with the spool holder	520 x 500 x 570 [mm]
Machine dimensions with the spool holder and HEPA filter	570 x 500 x 570 [mm]
Package dimensions	600 x 600 x 570 [mm]
Full Set weight	28.70 [kg]
Machine weight	14.45 [kg]
Single Extruder Toolhead 1.75 weight	0.70 [kg]
Dual Extruder Toolhead weight*	1.00 [kg]
CNC Milling Toolhead weight	0.90 [kg]
Laser Toolhead weight	0.32 [kg]
Thick Paste Extruder Toolhead weight*	0.60 [kg]

### 3D printing specifications

Printing technology	FFF - (ang. Fused Filament Fabrication)
Printing head	Single material 1.75 [mm] Dual material - single nozzle 1.75 [mm] * Single material 3.00 [mm] *
Layer resolution	0.05 - 0.4 [mm] **
Minimum wall thickness	0.4 [mm] **
Dimensional accuracy of the Fabricated model	+/- 0.2 [mm]
Platform calibration	Automatic, Manual
Printing volume	235 x 250 x 165 [mm]
Filament diameter	1.75, 3.00 [mm]
Nozzle diameter	0.3, 0.4, 0.6 [mm]
Support structures	Mechanically and chemically removable - depends on used material
Connectivity	USB, Ethernet, karta SD
Printable materials	PLA, ABS, PET, Nylon, PVA, HIPS, ASA, TPE, PP, PC, PMMA, PC/ABS
Third party filaments	Applicable
Printing speed	40 [mm/s]
Travel speed	120 [mm/s]

# Machine specification

## Laser cutting and engraving specifications

Toolhead	Laser Toolhead
Laser spot size for 50mm	0.1 x 0.1 [mm]
Laser spot size for 80 mm	0.1 x 0.18 [mm]
Wavelength	450 [nm]
Laser class	4
Laser power	2.8 [W]
Operating sound	40 [dB] (55 [dB] with HEPA filter)
Platform calibration	Manual
Cutting/engraving volume	235 x 250 x 85 [mm]
Cutting/engraving speed	15 [mm/s]
Travel speed	120 [mm/s]
Cutting/engraving materials	Wood, Wood-like, Leather, Paper, Cartoon, Felt, Foil, EPP, EVA foam, CCL FR4***

## Milling specifications

Toolhead	CNC Milling Toolhead
Spindle power	300 [W]
Operating sound	<70 [dB]
Platform calibration	Manual
Cutting volume	235 x 250 x 85 [mm] ***
Cutting speed	0.1 ~ 20 [mm/s]
Travel speed	120 [mm/s]
Milling materials	ABS, nylon, HDPE, PTFE, PC, PP, POM, PMMA, PVC, HIPS, LDPE, PET, carbon fiber, ccl fr4, dibond, tcf, wood, ply-wood, wood fiber boards, aluminum, brass, copper, cardboard, machining wax, modeling board, styrodur
Tool holding	ER-11 collet

## Temperature specifications

Nozzle temperature	max. 250 [°C]
Build plate temperature	max. 115 [°C]
Operating ambient temperature	15 - 30 [°C]
Storage temperature	-10 ~ 40 [°C]

# Machine specification

---

## Electrical specifications

---

Power supply	100 [VAC] ~ 4 [A] 50/60 [Hz] 240 [VAC] ~ 2 [A] 50/60 [Hz]
Power consumption	max. 350 [W]
Single Extruder Toolhead 1.75 power consumption	max. 220 [W]
Dual Extruder Toolhead power consumption	max. 230 [W]
CNC Milling Toolhead power consumption	max. 330 [W]
Laser Toolhead power consumption	max. 82 [W]

## Software specifications

---

Supplied software	Voxelizer
Supported file types	.stl, .obj, .step, .dxf, .png, .bmp
Minimum system requirements	Windows 7/10 (64 bit) Mac OS (10.13 or higher) Linux (experimental)

## HEPA filter specification

---

Type of filter	HEPA/Carbon
Fan power	1.54 [W]
Filter lifespan	1000 h or 6 months
Filter dimensions	80 x 80 x 25 [mm]
Filter Cover dimensions	85 x 85 x 50 [mm]
Filter control	Temperature based

\* Available on demand,

\*\* Depends on nozzle diameter,

\*\*\* Depends on mounted milling cutter dimensions

\*\*\*\* Engraving - only if the surface is covered with black paint.



# Setting up Zmorph Fab

## 9.2 Safety features removal

After the machine has been set up at the target workplace, before it is put into operation for the first time, remove the safety band from the toolhead and the protective foam from the worktable.



Open the front cover of the machine to the point where it touches with the back cover. Magnetic latches will keep the cover open.



Remove the protective tool band.



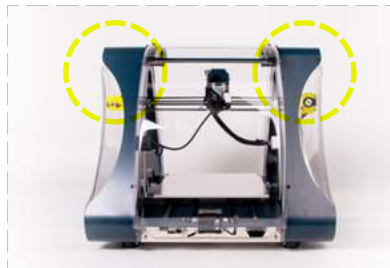
Gently remove the work table protection foams.

## 9.3 Assembling the spool holder

For a better experience with the Zmorph Fab machine, it is recommended to assemble the dedicated spool holder.



Prepare the spool holder components and a 2.5 mm Allen key.



Look at the back of Zmorph Fab. Spool holder attachment screws are placed at the top of the frame and highlighted on the picture.



Loosen the frame screws with a 2.5 mm Allen key.

# Setting up Zmorph Fab



Loosen the screws to the point where you can slide the spool holder.



Slide the spool holder in place.



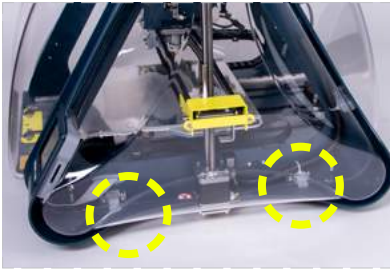
Tighten the screws.



Take out the filament roll from the plastic bag and slide it on the bar. Put the bar with filament on the holders.

## 9.4 Assembling the HEPA filter

A filtration system can be mounted on the Zmorph Fab machine.



Find the two hooks blocking the covers.



Release the cover rear corner from the hooks by gently squeezing the cover.



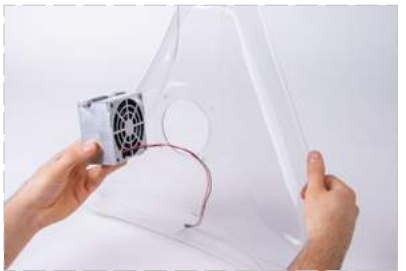
Pull out the cover rear corner from the machine frame.



Pull out the cover upper corner from the machine frame.



Make sure all the necessary parts are prepared.



Pull the fan cable through the side cover mounting hole.



# Setting up Zmorph Fab



Mount the filter on the cover with the provided screws.



Connect the fan cable to the socket behind the Z axis motor.



Start mounting the side cover by placing the top corner in its position.



Next push the front corner behind the LCD screen.



Finally squeeze the rear corner and push it inside the holding hooks.



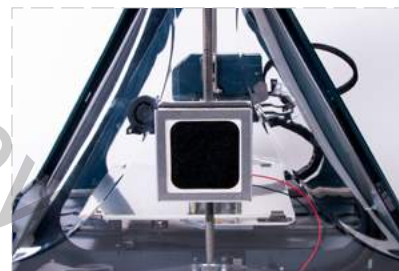
Push out the filter cartridge from the metal holder.



Unpack it from the plastic wrapping.



Push the filter cartridge into the metal holder.



Make sure that the carbon filter is on the outside.

## NOTE

Make sure that the fan cable is correctly positioned and does not interfere with the cover and any mechanical parts.

Make sure that all hooks are holding the side cover properly.

# Setting up Zmorph Fab

## 9.5 First use

When the machine is commissioned for the first time after transport, it is necessary to perform an initial calibration process (for more information, see the [chapter on autocalibration](#)). During this process, the machine will heat up and it will be necessary to insert material into the toolhead. After the calibration process, the machine is ready to perform its first print.



Connect the power cable to the socket.



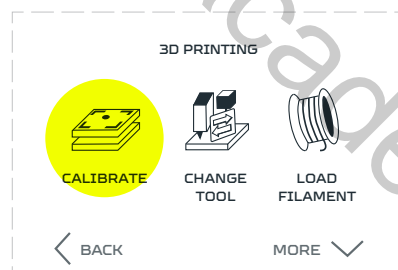
Turn on the machine.



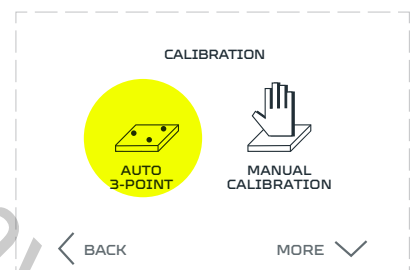
Apply 3D printing adhesive to the center of the worktable. Two layers should be enough.



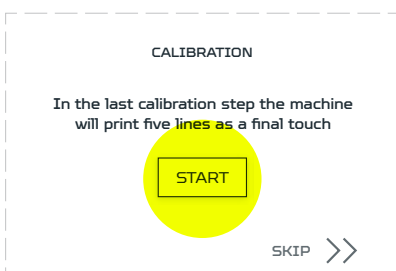
Choose 'MAINTENANCE'.



Choose 'CALIBRATE'.



Choose 'AUTO 3-POINT'. Wait for the machine to heat up and finish the probing.



To ensure best calibration result print calibration pattern. Choose 'START'.



# 10. Maintenance

## 10.1 Toolheads maintenance

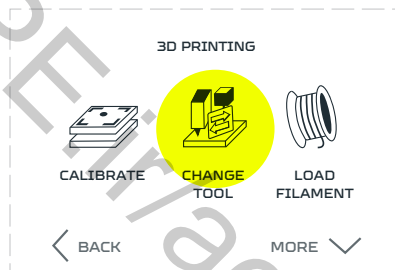


Changing and mounting toolheads require 3 mm Allen key usage. It is included in the foam insert with accessories.

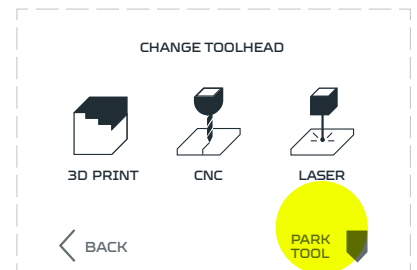
### Dismounting Toolhead



Select 'MAINTENANCE'.



Select 'CHANGE TOOL'.



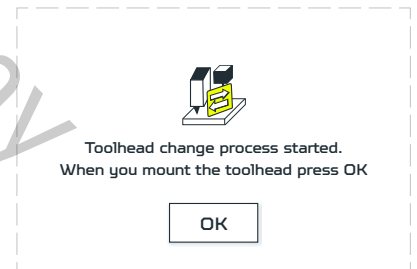
Select 'PARK TOOL', wait for positioning process to be finished.



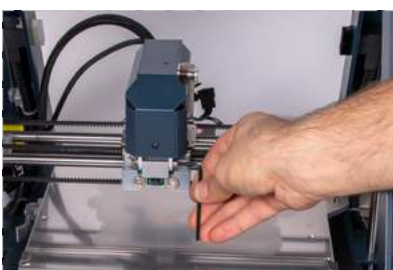
Disconnect the toolhead cable from the machine frame socket.



Disconnect the toolhead from the X carriage.



Zmorph Fab will inform about toolhead change process.



Use 3 mm Allen key to loose the screw mounting the toolhead.



Lift the toolhead from the front and push it backwards.



Printer is ready for mounting another toolhead.

# Maintenance

## Mounting toolhead

Each toolhead has similar mounting method



Find the bottom hooks placed on the back of the toolhead.



While placing the toolhead be sure the hooks are in the right place.



Gently mount new toolhead placing it from the back to the front in the X-carriage.



Tighten the mounting screw while gently pushing the toolhead forward.

### NOTE

Tightening the mounting screw without pushing the toolhead to the front might cause the connection between the toolhead and X carriage to be loose. This might cause further errors in calibrations and printing processes.

Each time after changing the toolhead it is better to check if the connection is correct. Lift the back of the toolhead and check if the rear hooks are not moving up and down. If yes, loose the front mounting screw and once again push and hold the toolhead forward and tighten the mounting screw.

# Maintenance

Next steps depend on which method and toolhead will be used:

## Smart Toolhead change process

### Single Extruder Toolhead 1.75

- Connect the LEFT cable to the LEFT frame socket.
- Connect the extruder 'A' cable to the 'A' plug and the 'B' cable to the 'B' plug on the X carriage.

### Laser Toolhead

- Connect the LEFT cable to the LEFT frame socket and RIGHT cable to the RIGHT frame socket.

### Thick Paste Extruder Toolhead

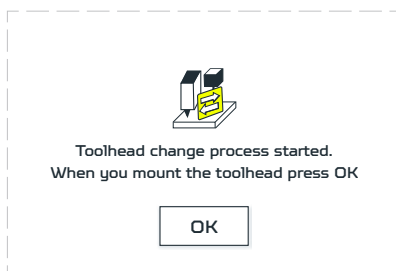
- Connect the LEFT cable to the LEFT frame socket.
- Connect the extruder 'A' cable to X carriage 'A' plug.

### Dual Extruder Toolhead

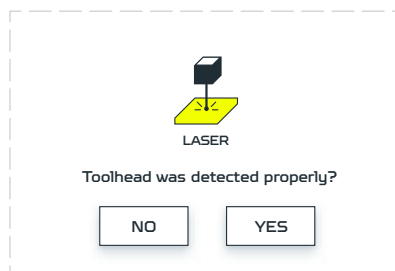
- Connect the LEFT cable to the LEFT frame socket and RIGHT cable to the RIGHT frame socket.
- Connect the extruder 'A' cable to the 'A' plug and the 'B' cable to the 'B' plug on the X carriage.

### CNC Milling Toolhead

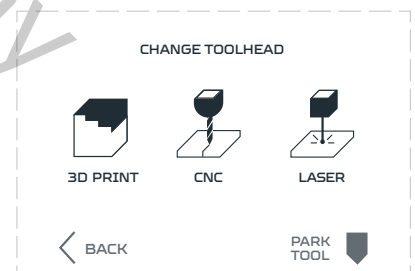
- Connect the LEFT cable to the LEFT frame socket.
- Connect the extruder 'A' cable to X carriage 'A' plug.



After connecting all extruder cables choose 'OK'.



Zmorph Fab will recognize the toolhead automatically. If toolhead is correct choose 'YES'.



If machine doesn't recognize the toolhead choose 'NO' and it will lead you to Change tool menu, where you can choose your toolhead manually.

# Maintenance

---

## Manual Toolhead change

### Single Extruder Toolhead 1.75

- Connect the LEFT cable to the LEFT frame socket.
- Connect the extruder 'A' cable to the 'A' plug and the 'B' cable to the 'B' plug on the X carriage
- Choose 'Maintenance'.
- Choose 'Change tool'.
- Choose '3D printing'.
- Choose 'Single printing'.
- Choose 'Single Extruder Toolhead 1.75'.

### Laser Toolhead

- Connect the LEFT cable to the LEFT frame socket and RIGHT cable to the RIGHT frame socket.
- Choose 'Maintenance'.
- Choose 'Change tool'.
- Choose 'Laser'.

### Thick Paste Extruder Toolhead

- Connect the LEFT cable to the LEFT frame socket.
- Connect the extruder 'A' cable to X carriage 'A' plug.
- Choose 'Maintenance'.
- Choose 'Change tool'.
- Choose '3D printing'.
- Choose 'Thickpaste printig'

### Dual Extruder Toolhead

- Connect the LEFT cable to the LEFT frame socket and RIGHT cable to the RIGHT frame socket.
- Connect the extruder 'A' cable to the 'A' plug and the 'B' cable to the 'B' plug on the X carriage.
- Choose 'Maintenance'.
- Choose 'Change tool'.
- Choose '3D printing'.
- Choose 'Dual printing'.
- Choose 'Dual Extruder Toolhead'

### CNC Milling Toolhead

- Connect the LEFT cable to the LEFT frame socket.
- Connect the extruder 'A' cable to X carriage 'A' plug.
- Choose 'MAINTENANCE'.
- Choose 'CHANGE TOOL'.
- Choose 'CNC'.

# Maintenance

## 10.2 Changing worktable



Place toolhead in convenient position for removing the worktable.



Slide the table backwards.



Disconnect the table plug.

### NOTE

User can move the toolhead manually by disabling the motors by:

- pressing the reset button,
- powering down the machine,
- parking the toolhead in the 'Change toolhead' section,
- waiting 1 minute for the standby mode.



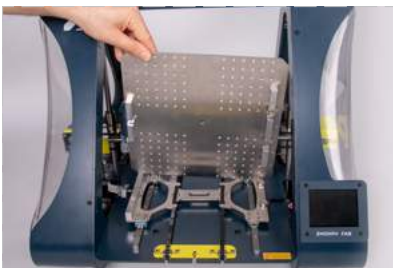
Pull the worktable forward.



Pull the lever placed on the left to unlock the heated table.



Lift the table with a little bit of strength up to disconnect it from the carriage magnets.



Take the CNC table. Check if the magnets under the table are on the proper side.



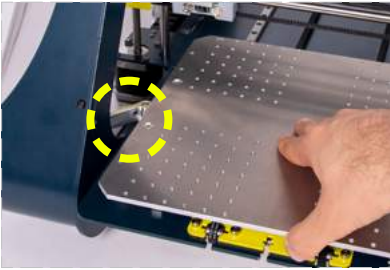
Place the worktable on the carriage, magnets will clip it on.



Pull the lever back to block the table.



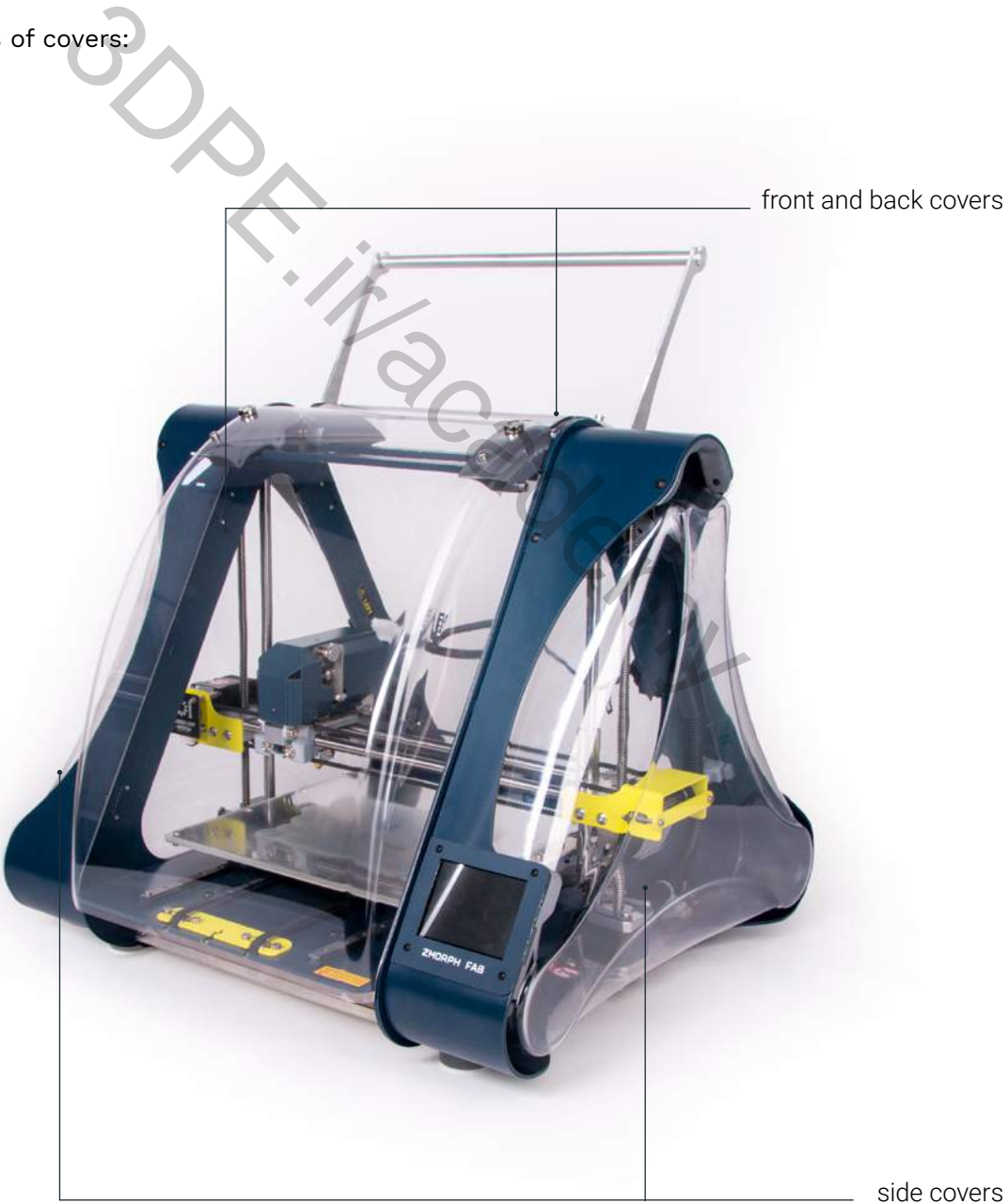
# Maintenance



Make sure that the lever doesn't block the table movement by pulling forward.

## 10.3 Removing covers

There are two types of covers:



front and back covers

side covers

# Maintenance

## Front and back covers

To remove front and back covers:



Lift them up.



Grab on both sides.



Pull toward yourself.

They are snapped via magnets so removing and attaching comes easily. The differences between front and back cover are shown in the picture below. Front cover has additional magnets that allow snapping in elevated position attached.



Front and back cover.



Front cover closed.

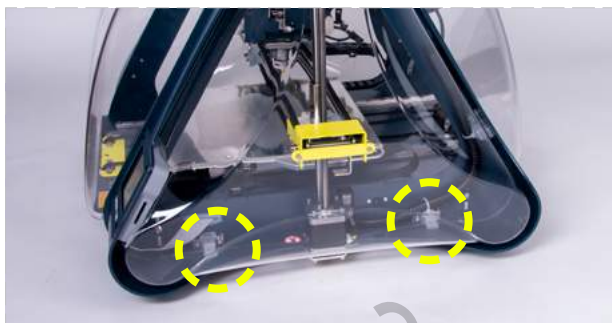


Front cover opened.

# Maintenance

## Side covers

To remove side covers:



Find the two hooks blocking the covers.



Release the cover rear corner from the hooks by gently squeezing the cover.



Pull out the cover rear corner from the machine frame.



Pull out the cover upper corner from the machine frame.

### NOTE

To mount a cover, firstly slide in the upper side. Then adjust the lower side and place it in the hooks.



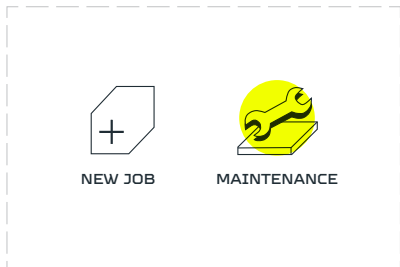
Left and right cover.

Side covers are NOT identical. The right cover contains a space for the screen.

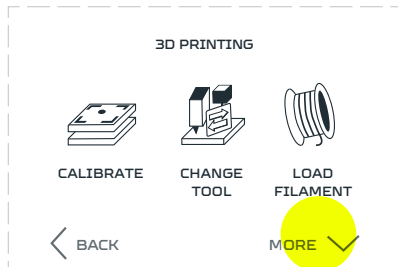


# Maintenance

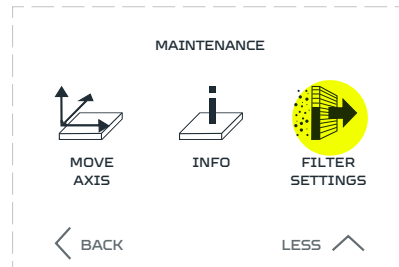
## 10.4 How to change the filter cartridge



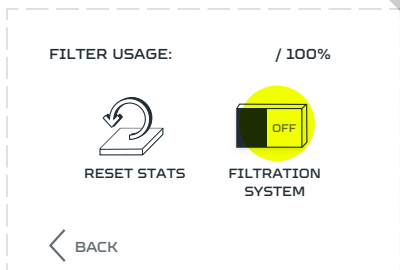
Choose 'MAINTENANCE' from the LCD touchscreen menu.



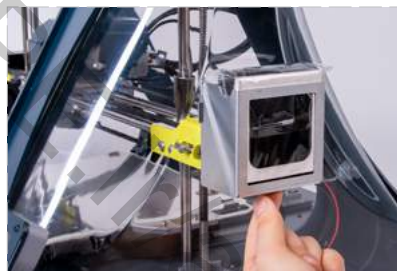
Choose 'MORE'.



Enter the 'HEPA FILTER' menu.



Turn OFF the Filter.



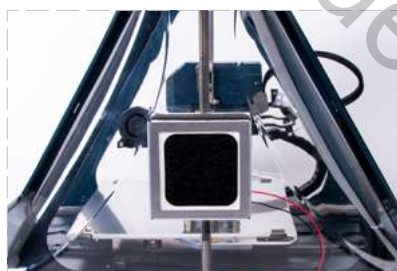
Push the filter cartridge out from below.



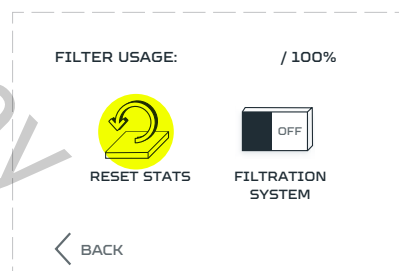
Remove the filter cartridge from the metal holder.



Unpack the new filter cartridge and insert it to the metal holder.



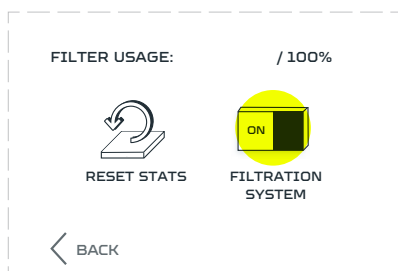
Make sure the carbon filter is on the outside



Reset the statistics for the new filter cartridge



Confirm



Turn ON the Filtration system

# Maintenance

## 10.5 Communication and File Delivery

### Delivery of files on SD card



Save a file you want to print to on an SD card.



Insert a the card on the right hand side of the display.

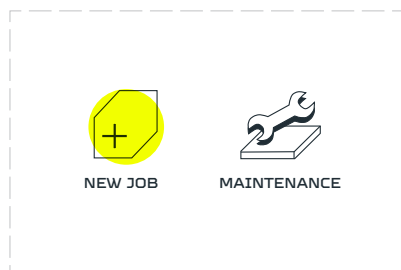
#### NOTE

If the user inserted the external SD card the screen should jump forward to the 'Choose File' menu screen on the 'EXTERNAL' directory.

If there was no previously chosen file, after pressing on the 'New job' menu the screen will go directly to the 'Choose File' menu.

# Maintenance

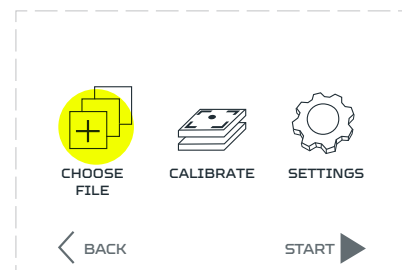
Choose a folder with files from the external SD card



New project



Choose file in external tab



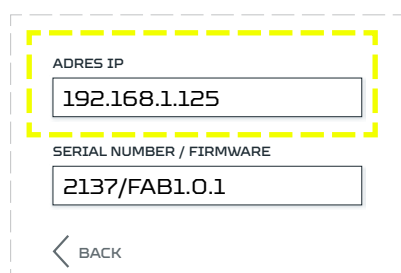
Choose file

## Connecting the machine via Ethernet



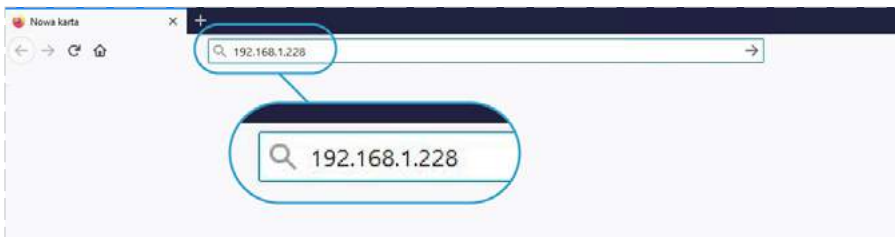
Connect Ethernet cable to the back of the machine and a computer.

The information about the IP address of the machine can be found in the INFO screen in the MAINTENANCE menu.

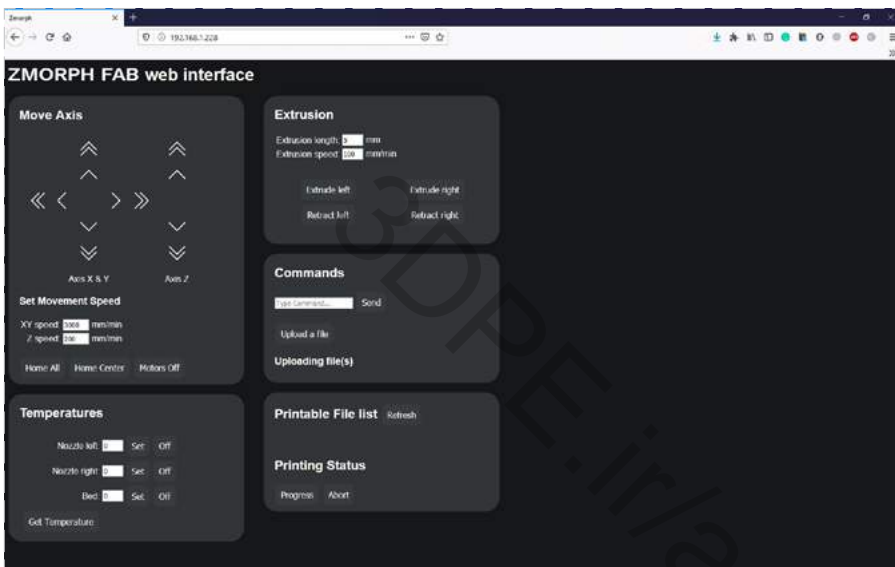


Info screen

# Maintenance



Provide the IP address in the web browser window.



A full interface for controlling the machine and files sharing will appear in the web browser.

## Connecting the machine via USB.



Connect the USB cable to the back of the machine and a computer.

- Wait until the computer discovers the machine and installs the drivers.
- If the computer doesn't discover a USB device, click the reset button on the machine.
- The machine should be discovered as a Flash memory and you can access it from the 'My Computer' folder

# 11. Voxelizer

## 11.1 Installation and system requirements

Voxelizer can be downloaded from the website [zmorph3d.com/voxelizer](http://zmorph3d.com/voxelizer). Once the download is finished, run the installation wizard and follow the instructions provided on the screen.

Minimum system requirements:

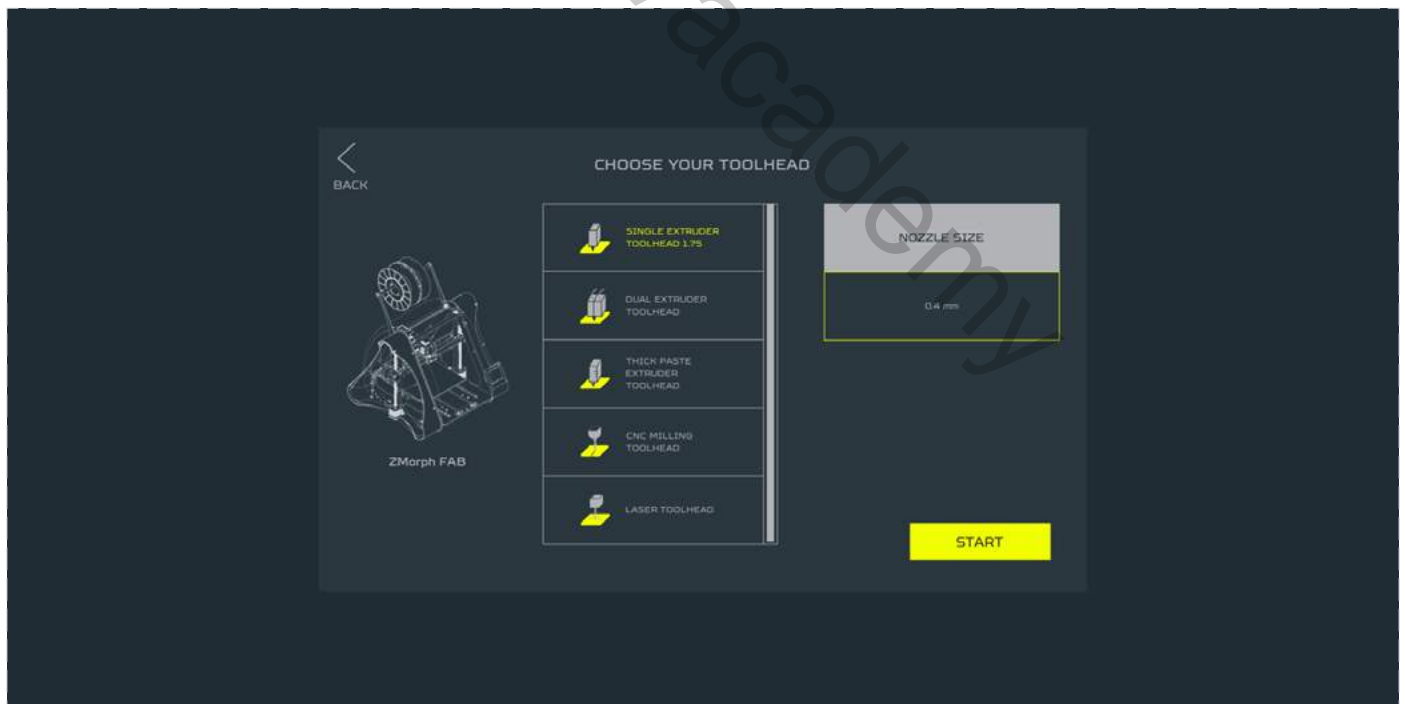
- Operating system: Windows 7 or higher, 64-bit or MacOS 10.13 or higher (Mac Mini 6.0 Late 2012 or later, other Apple devices 2014 or later)
- 4GB RAM,
- GPU with OpenGL 3.3 support,
- Internet connection.
- Resolution 1280 x 720 pixels.

## 11.2 Files maintenance and preparation

Voxelizer handles all the Zmorph toolheads in separate workflows: 3D printing, CNC milling, laser cutting, and thick paste extrusion.

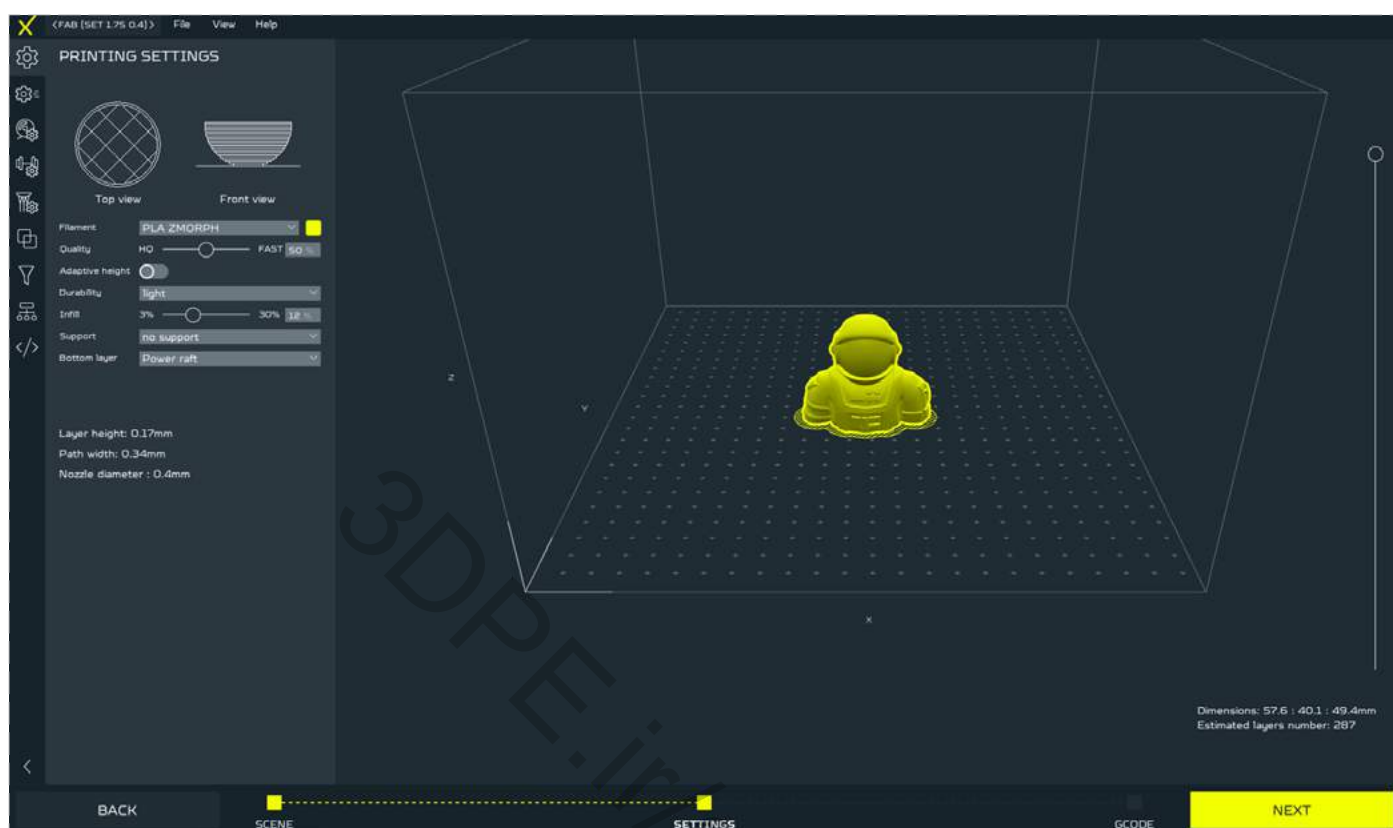
Each workflow is composed of three steps: during the first one the files are imported, scaled, oriented and positioned on the table; the second step is dedicated to configuring the Fabrication process by specifying the used materials and other settings; during the third step instructions for the machine (G-code) are generated, previewed and exported.

Taking the 3D printing workflow as an example, after selecting the tool in the welcome wizard, import a model in one of the different formats supported, for instance, an .STL. In the Scene view, it's possible to set its dimensions and orientation. When finished, click Next.

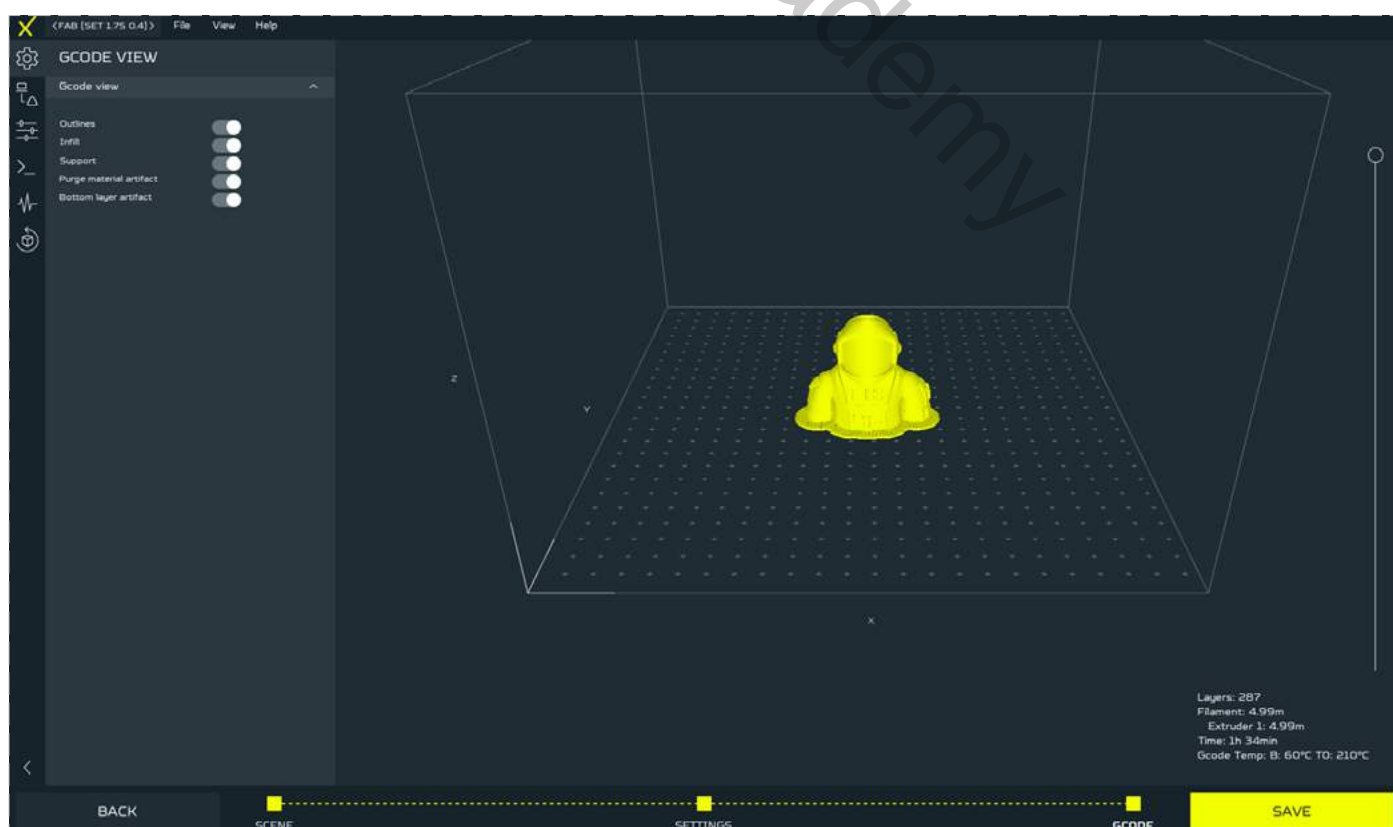


In the settings view, apply the main presets, based on the type of filament that is going to be used. It's possible to dig deeper into the different, more advanced settings and apply further transformations to the model via filters and voxel selection. When everything is set up, click Next to generate the G-code.

# Voxelizer



The G-code view provides a preview of the operations that a machine will perform. It's also possible to inspect the G-code instructions and look for possible errors by using the Diagnostic tab. Clicking on the Save button results in saving the G-code: on a computer, SD card or directly on Zmorph Fab Multitool 3D Printer.

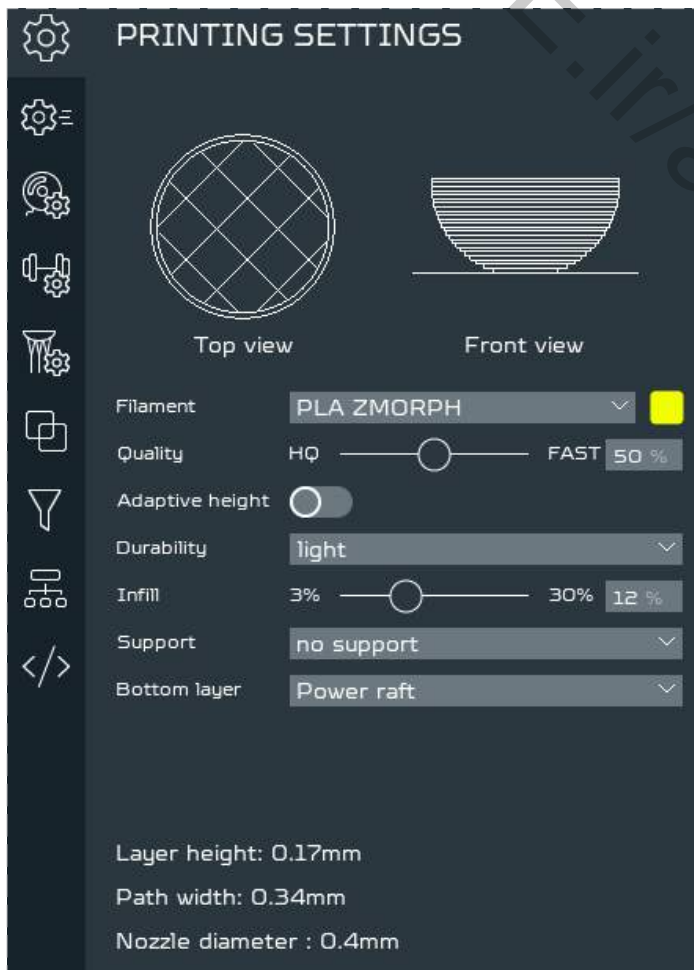




## 11.3 Presets

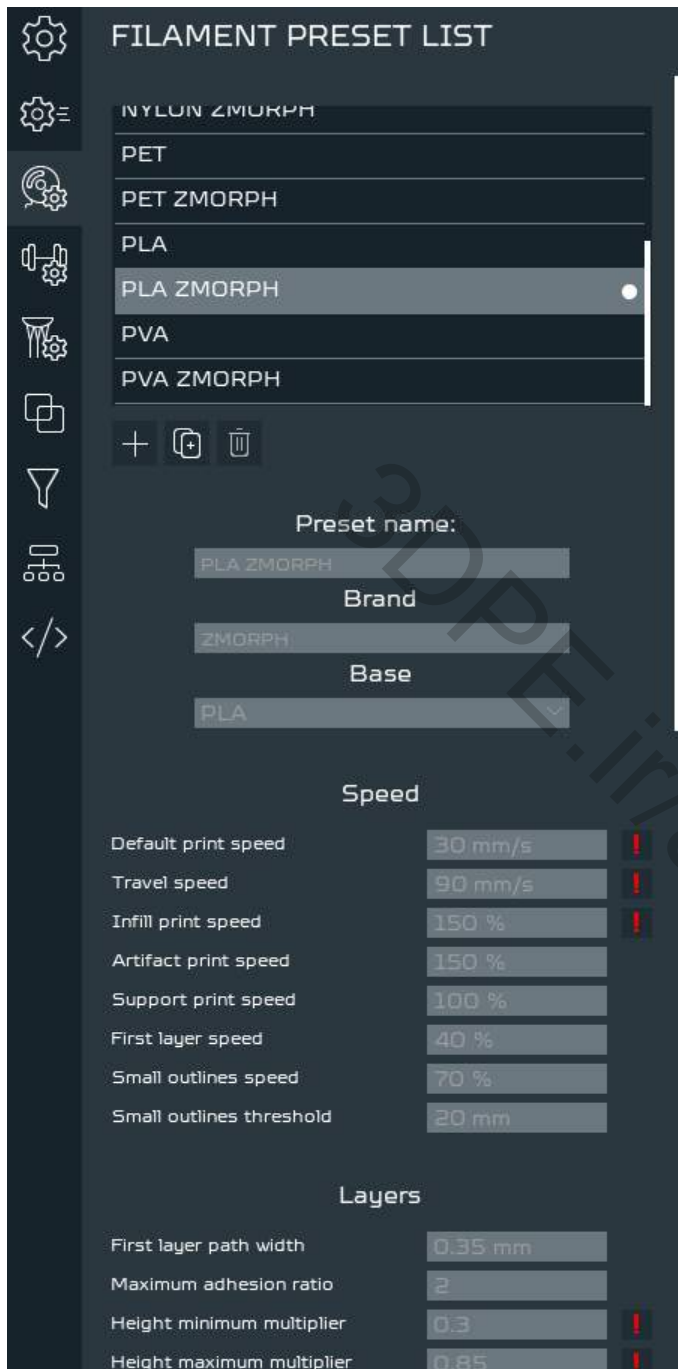
Voxelizer includes a set of tested presets for standard Fabrication scenarios in all workflows. The user can define their own presets to adapt the software to new materials and specific project requirements.

Workflow	Preset types
3d printing	Filament, Durability, Support
Laser cutting	Material
CNC milling	Material, Operation tool



Taking the 3D printing workflow as an example, presets can be edited and selected in the SETTINGS view. In the Printing settings tab, they can be chosen from the available default materials and the ones prepared by the user.





The customized user presets can be added and modified in tabs dedicated to presets, e.g 'Filament preset list'. There are also other tabs signed by tooth gear icon responsible for durability and support structures settings.



To add a new preset, duplicate or delete existing presets click on the buttons below the Filament preset list. After editing preset parameters, the changes will save automatically. The preset will remain until its deleted.

To use the new preset in a project, It's important to remember about selecting it in 'PRINTING SETTINGS'.

## 12. 3D printing workflow

### 12.1 Toolheads

#### Single Extruder Toolhead 1.75mm

A basic toolhead giving access to all 3D printing functionalities using 1.75 mm filaments. It's perfect for manufacturing single-material prototypes, jigs and fixtures, and other high-quality models from almost all materials available on the market such as: ABS, M-ABS, PLA, HIPS, Flex, PVA, PET, ASA and similar. The default nozzle is 0.4 mm



#### Specification:

- Construction: High-quality 3 mm aluminium frame
- Hot End: M6 thread 1.75mm nozzle
- Temperature control: 1 thermistor
- Temperature range: 0 - 250 °C
- Nozzles: 0.3, 0.4, 0.6 mm
- Motor: Nema 17 stepper motor
- Extrusion: Direct drive
- Work area: up to 235 x 250 x 165 mm
- Recommended printing resolution: 0.2 mm (200 microns)
- Supported printing resolution: 0.05 - 0.4 mm
- Extruder dimensions: 125 x 115 x 58 mm

# 3D printing workflow

## Dual Extruder Toolhead

The basic toolhead giving access to all 3D printing functionalities, using 1.75 mm filaments. It's perfect for manufacturing double-material prototypes, jigs and fixtures and other high-quality models from almost all materials available on the market as: ABS, M-ABS, PLA, HIPS, Flex, PVA, PET, ASA and others. Default nozzle is 0.4 mm.



### Specification:

- Construction: High-quality 3 mm aluminum frame
- Hot End: Zmorph interchangeable Mixer Hotend
- Temperature control: 2 thermistors
- Temperature range: 0 – 250 °C
- Nozzle: 0.4 mm
- Motor: Nema 11 stepper motor with planetary gear x2
- Extrusion: Direct Drive
- Work area: up to 235 x 250 x 165 mm
- Recommended printing resolution: 0.2 mm
- Supported printing resolution: 0.025 – 0.4 mm
- Extruder dimensions: 170 x 115 x 70 mm

# 3D printing workflow

## 12.2. 3D printing materials

### Single Extruder Toolhead 1.75



PLA



ABS



Nylon



PET-G



ASA



PMMA



TPE



PC



PC/ABS



PP



PVA



HIPS

# 3D printing workflow

## Dual Extruder Toolhead Toolhead Toolhead



PLA-PLA



ABS-HIPS



PLA/PVA



ABS/ABS

### NOTE

Check the material library for more information about our materials:  
[bit.ly/ZmorphMaterialsLibrary](https://bit.ly/ZmorphMaterialsLibrary)

## 12.3 Loading the filament

### Single Extruder Toolhead 1.75



Prepare the material. The 0.5 kg spool is included in the package. Take out the filament roll from the plastic foil, remove the moisture absorber.



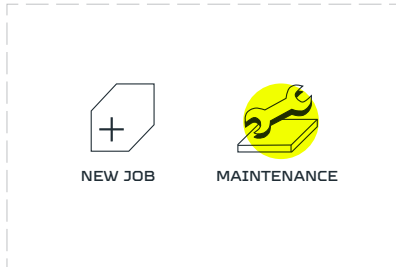
You can find out what kind of filament you own by looking at the sticker on the filament roll. Zmorph Fab package comes with PLA.



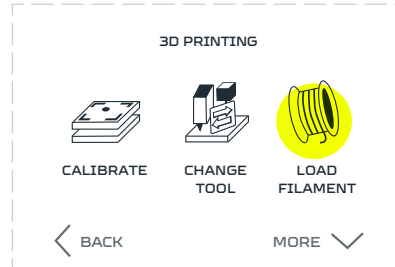
Slide the spool on the bar and place it on the machine.

# 3D printing workflow

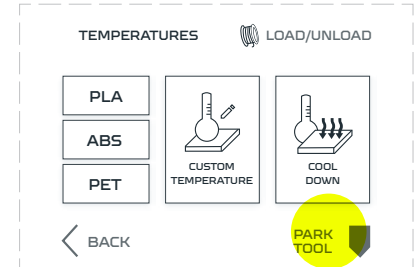
To preheat the extruder, follow these steps.



Choose the 'MAINTENANCE' from the LCD touchscreen menu.



Choose 'LOAD FILAMENT'.



Choose 'PARK TOOL', wait for the machine to position the toolhead. When done, choose 'PLA' to preheat the material.

## NOTE

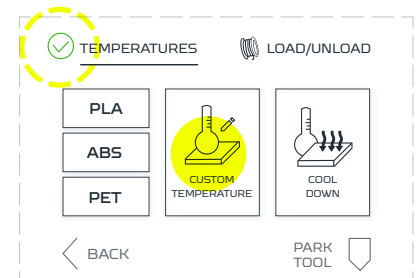
The 'PREHEAT PLA' button will heat the nozzle to 210°C the 'PREHEAT ABS' and 'PREHEAT PET' to 240°C.



Take off the front cover.



Straighten the tip of the filament up or cut its end.



Wait till extruder reaches the proper temperature. The yellow 'TEMPERATURES' sign will change colour from yellow to green.



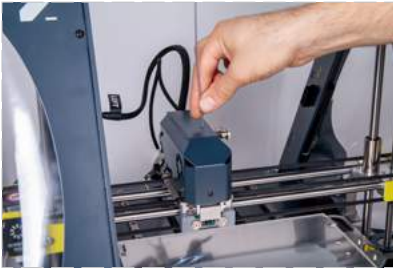
Insert filament into the guide hole on top of the extruder.

## NOTE

New Single 1.75 Extruder Toolhead has a filament sensor, when it's preheated it will start the fillament loading automatically when filament is pushed into the guide.



# 3D printing workflow



Push the filament down until you feel it has been grabbed by extruder drive gear.



Wait until the material flows out of the nozzle. Tap the feed button again if necessary.

## NOTE

By tapping the button showing '80 mm' you can change the amount of extruded filament to 15 or 5 mm.

## Dual Extruder Toolhead



Take out the filament rolls from the plastic foil, remove moisture absorber

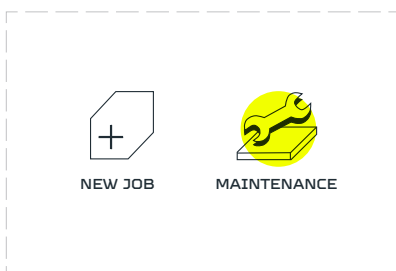


You can find out what kind of filament you own by looking at the sticker on the filament roll.

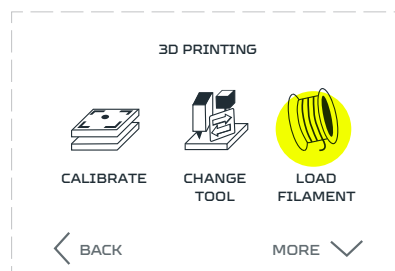


Slide spools on the bar and place it on the machine.

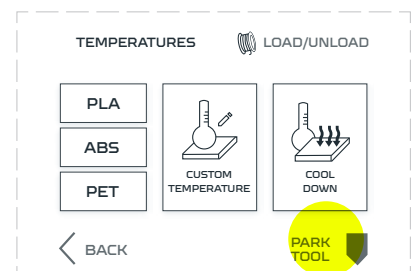
To preheat the extruder, follow these steps.



Choose 'MAINTENANCE' from the LCD touchscreen menu.



Choose 'LOAD FILAMENT'.



Choose 'PARK TOOL', wait for the machine to position the toolhead. When done, choose 'PLA' to preheat the material.

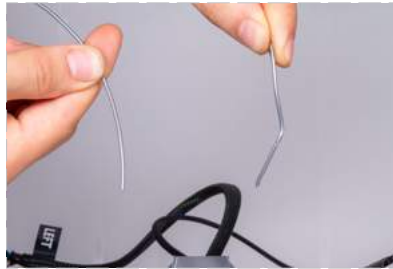
# 3D printing workflow

## NOTE

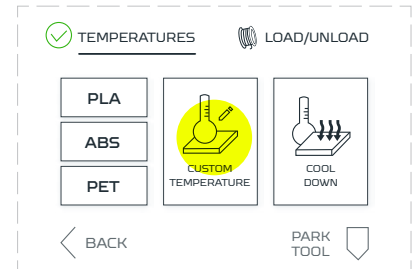
NOTE: The 'PREHEAT PLA' button will heat the nozzle to 200°C the 'PREHEAT ABS' and 'PREHEAT PET' to 240°C



Take off the front cover.



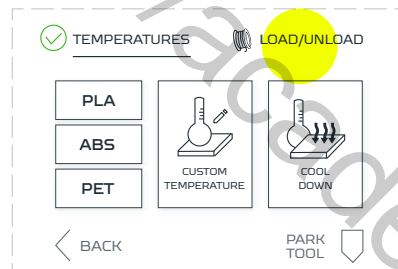
Straighten the tip of filament up or cut its end



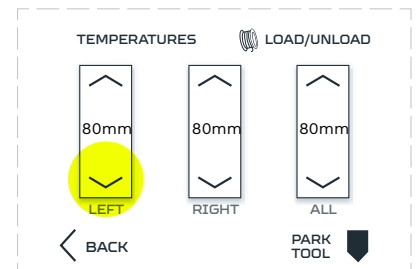
Wait till extruder reaches the proper temperature. The yellow 'TEMPERATURES' sign will change colour from yellow to green.



Insert the filament into the left side guide hole on top of the extruder.



Tap the 'LOAD/UNLOAD' menu.



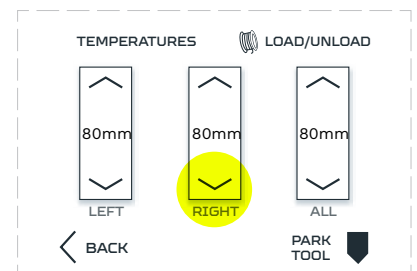
Tap the bottom arrow on the screen to feed 80 mm of the filament. Choose down arrow with LEFT description to do that.



Push the filament down until you feel it has been grabbed by the extruder drive gear.



Insert the second filament into the right side guide hole on top of the extruder.



Tap the bottom arrow on the screen to feed 80 mm of the filament. Choose down arrow with RIGHT description to do that



# 3D printing workflow



Push the filament down until you feel it has been grabbed by the extruder drive gear.



Wait until the material flows out of the nozzle. Tap the feed button again if necessary

## NOTE

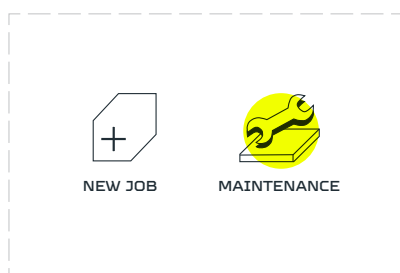
Third menu named ALL maintain both filaments at the same time. Tap down arrow with ALL description to feed both filaments.

By tapping the button showing '80 mm' you can change the amount of extruded filament to 15 mm or 5 mm.

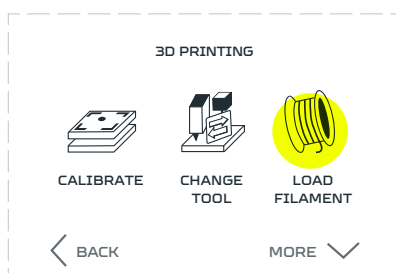
## 12.4 Removing the filament

### Single Extruder Toolhead 1.75

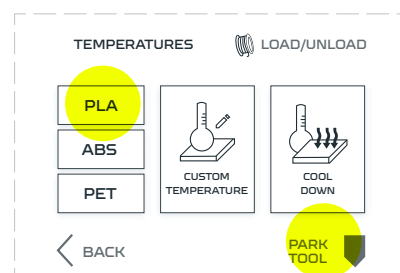
To preheat the extruder, follow these steps



Choose the 'MAINTENANCE' from the LCD touchscreen menu.

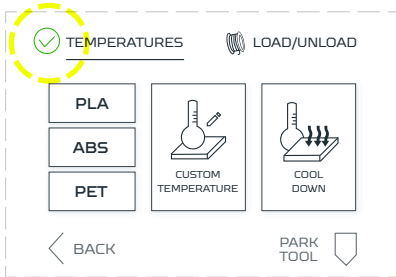


Choose 'LOAD FILAMENT'.

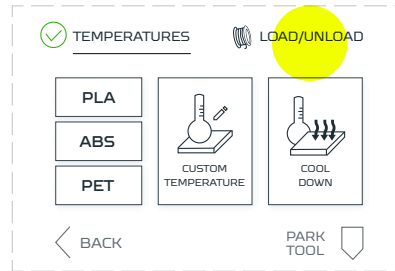


Choose 'PARK TOOL', wait for the machine to position the toolhead. When done, choose 'PLA' to preheat the material.

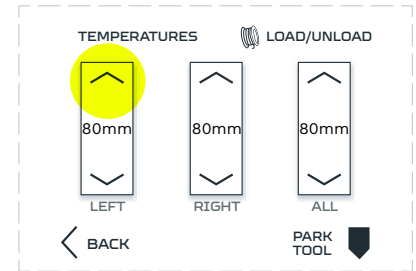
# 3D printing workflow



Wait till the extruder reaches the proper temperature. The yellow 'TEMPERATURES' sign will change colour from yellow to green.



Tap the LOAD/UNLOAD menu.



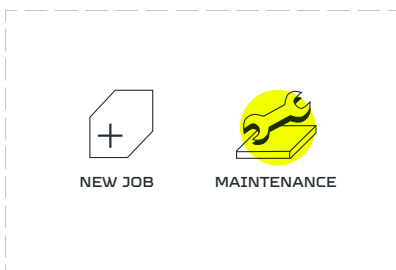
Tap the upper arrow on the screen to remove 80 mm of the filament. At first, extruder will load 40 mm to prevent clogging. Repeat if needed.

## NOTE

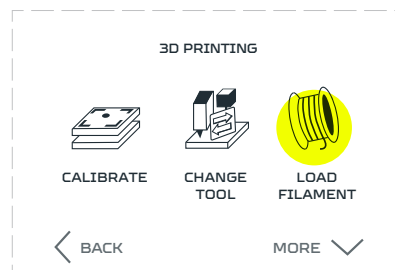
By triggering the button showing '80 mm' you can change the amount of extruded filament to 15 mm or 5 mm.

## Dual Extruder Toolhead

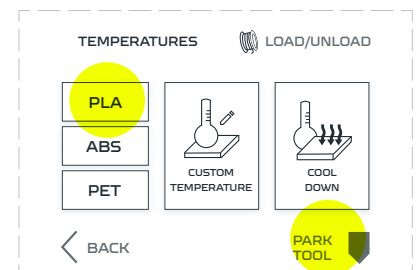
To preheat the extruder, follow these steps.



Choose 'MAINTENANCE' from the LCD touchscreen menu.

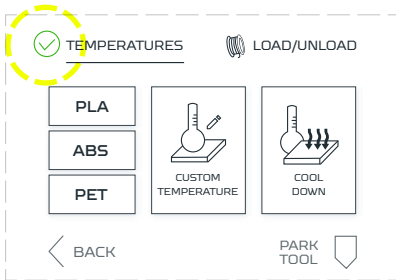


Choose 'LOAD FILAMENT'.

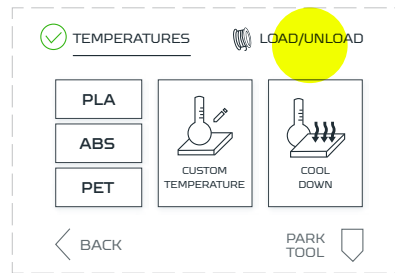


Choose 'PARK TOOL', wait for the machine to position the toolhead. When done, choose 'PLA' to preheat the material.

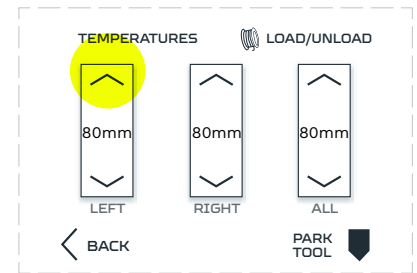
# 3D printing workflow



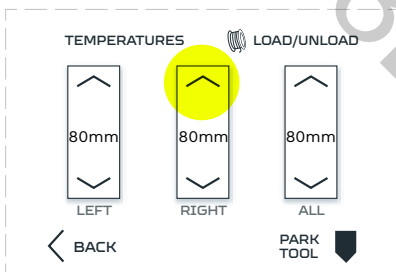
Wait till the extruder reaches the proper temperature. The yellow 'TEMPERATURES' sign will change colour from yellow to green.



Tap the LOAD/UNLOAD menu.



Tap the upper arrow on the screen to remove 80 mm of the filament. At first, extruder will load 40 mm to prevent clogging. Repeat if needed.



Tap the upper RIGHT arrow on the screen to remove 80 mm of the filament. At first, extruder will load 40 mm to prevent clogging. Repeat if needed.

## NOTE

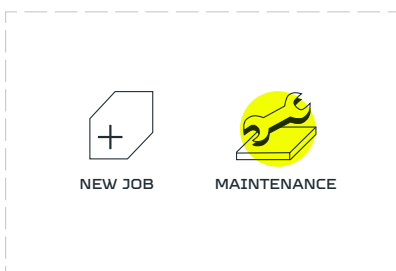
Third menu named ALL maintain both filaments at the same time. Tap down arrow with ALL description to feed both filaments.

By tapping the button showing '80 mm' you can change the amount of extruded filament to 15 or 5 mm.

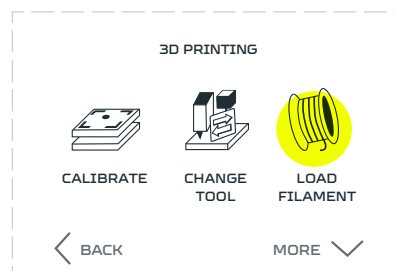
## 12.5 Material exchanging

### Single Extruder Toolhead 1.75

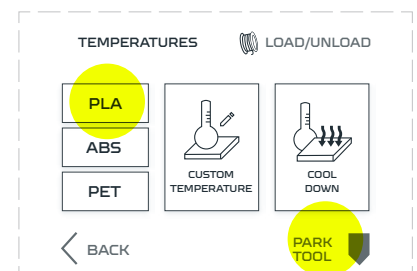
To preheat the extruder, follow these steps.



Choose 'MAINTENANCE' from the LCD touchscreen menu.

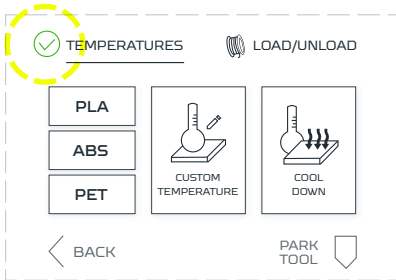


Choose 'LOAD FILAMENT'.

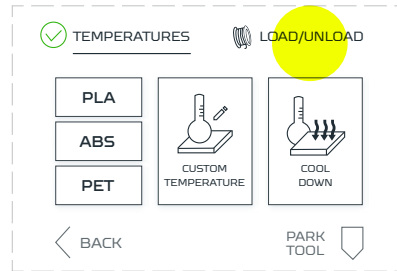


Choose 'PARK TOOL', wait for the machine to position the toolhead. When done, choose 'PLA' to preheat the material.

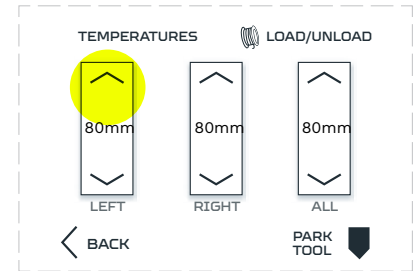
# 3D printing workflow



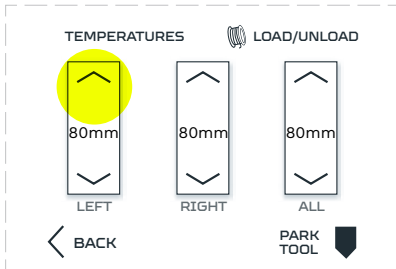
Wait till the extruder reaches the proper temperature. The yellow 'TEMPERATURES' sign will change colour from yellow to green.



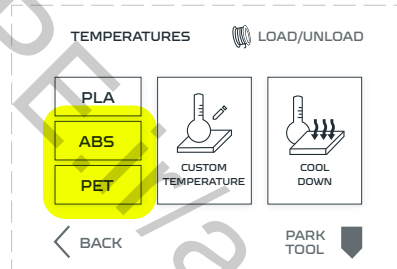
Tap the LOAD/UNLOAD menu.



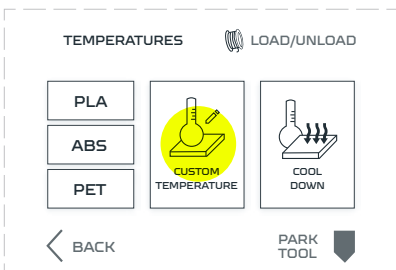
Tap the upper arrow on the screen to remove 80 of the filament. At first, extruder will load 40 mm to prevent clogging. Repeat if needed.



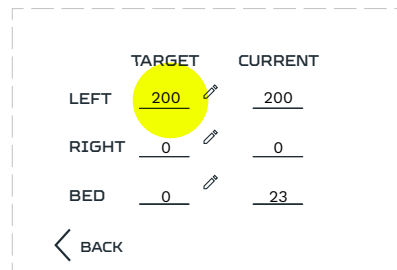
Adjust the temperature for the type of filament which will be used. To do that, tap the 'TEMPERATURES' menu first.



There are two ways to arrange the temperature for other materials than PLA. First option is by quick set up button 'ABS' or 'PET', which automatically arrange the temperatures for maintaining this filament.



For any other materials than PLA, ABS and PET temperatures needed to be set up manually. Tap the Custom Temperature button.

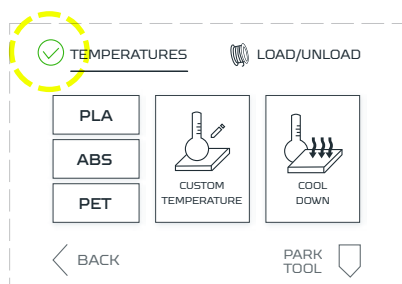


Tap the 'Left' gap in the 'Target': column.

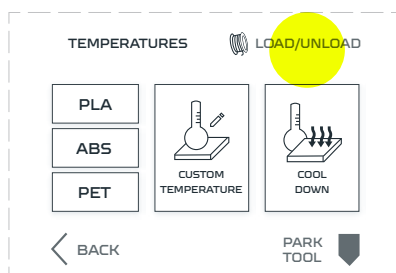


Tap the needed temperature on the keyboard, then OK.

# 3D printing workflow



Wait till the extruder to heat up.



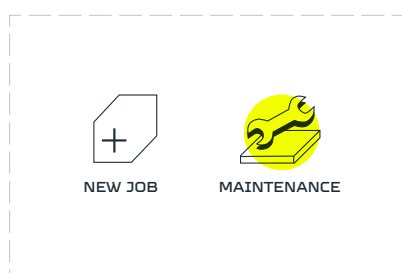
Go to the 'LOAD/UNLOAD' menu.



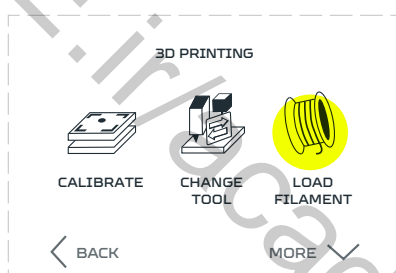
Feed the extruder by following steps from 'loading the filament' chapter.

## Dual Extruder Toolhead

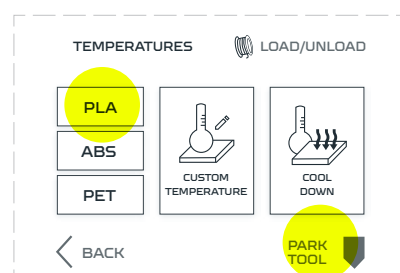
To preheat the extruder, follow these steps.



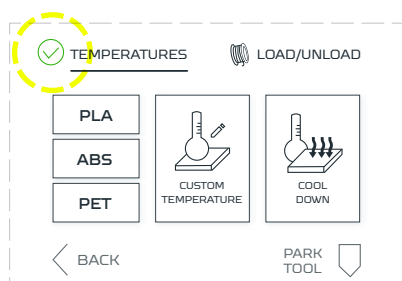
Choose the 'MAINTENANCE' from the LCD touchscreen menu.



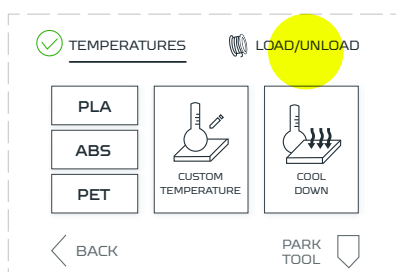
Choose 'LOAD FILAMENT'.



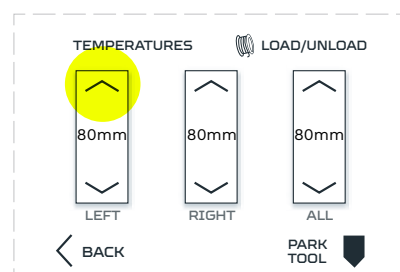
Choose PARK TOOL, wait for the machine to position the toolhead. When done, choose 'PLA' to preheat the material.



Wait till the extruder reaches the proper temperature. The yellow 'TEMPERATURES' sign will change colour from yellow to green.

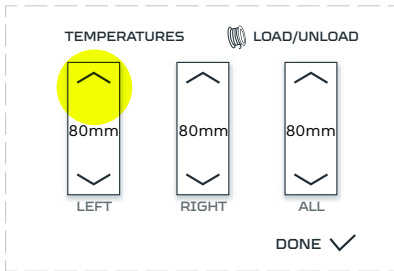


Tap the LOAD/UNLOAD menu.

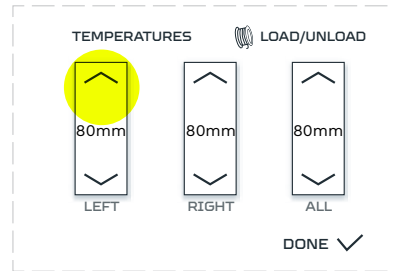


Tap the upper LEFT arrow on the screen to remove 80 mm of the filament. At first, extruder will load 40 mm to prevent clogging.

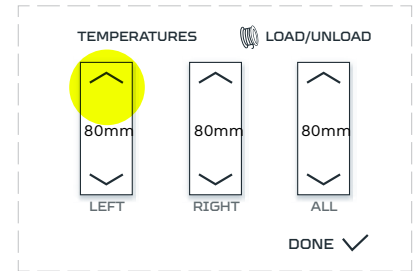
# 3D printing workflow



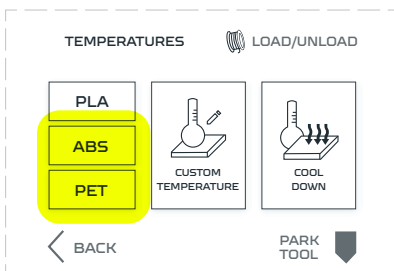
Tap the upper RIGHT arrow on the screen to remove 80 mm of the filament. At first, extruder will load 40 mm to prevent clogging.



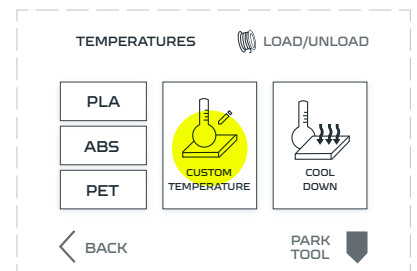
Repeat if needed. Third menu named ALL maintain both filaments at the same time. Tap upper arrow with ALL description to remove both filaments at the same time.



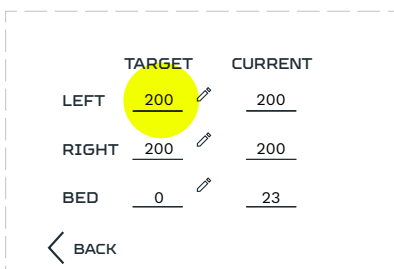
Adjust the temperature for the type of filament which will be used. To do that, tap the 'TEMPERATURES' menu first.



There are two ways to arrange the temperature for other materials than PLA. First option is by quick set up button 'ABS' or 'PET', which automatically arrange the temperatures for maintaining this filament.



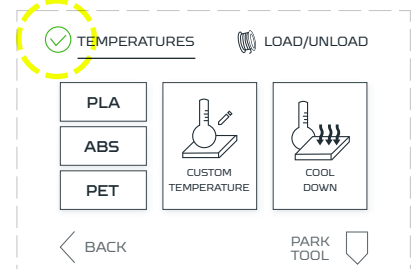
For any other materials than PLA, ABS and PET temperatures needed to be set up manually. Tap the Custom Temperature button.



Tap the 'Left' gap in the 'Target': column.

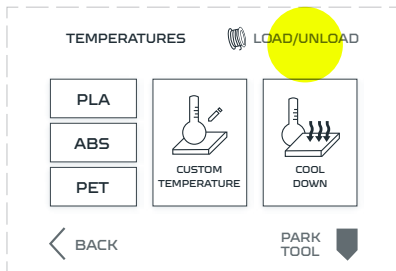


Tap the needed temperature on the keyboard, then OK



Since the Dual Extruder Toolhead has one nozzle, the set up temperature adjusts for left and right filament. Wait the extruder to heat up

# 3D printing workflow



Go to the LOAD/UNLOAD menu.

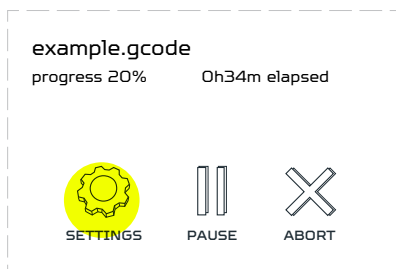


Feed the extruder by following steps from 'loading the filament' chapter.

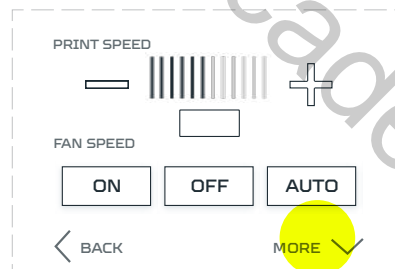
## 12.6 Filament replacement during printing

### Single Extruder Toolhead 1.75

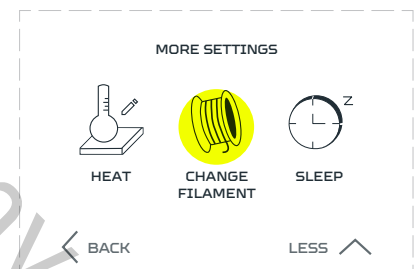
This function allows you to change the filament during the printing process. The new filament must be of the same material as the previous one (PLA/PLA) because the temperature of the extruder will be the same as for the filament that was there before.



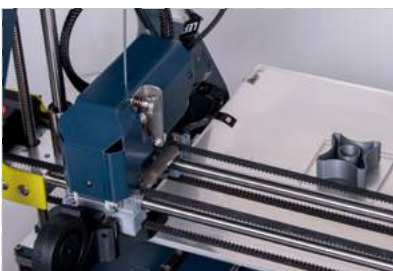
Tap the 'SETTINGS' menu.



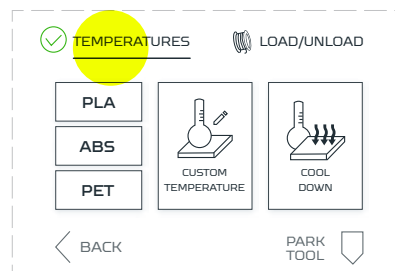
Choose 'MORE'.



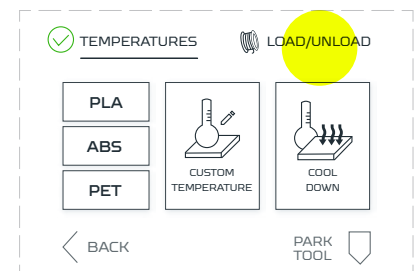
Choose 'CHANGE FILAMENT'



Wait until the extruder stops printing and lifts itself up.

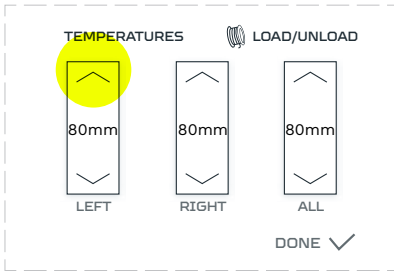


Tap the 'TEMPERATURES' menu and check if the extruder has the right temperature.

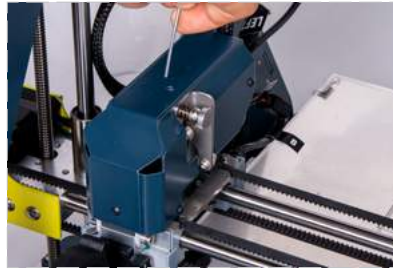


Tap the 'LOAD/UNLOAD' menu.

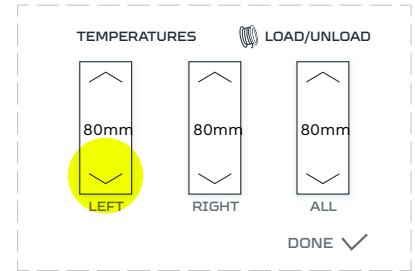
# 3D printing workflow



Tap the upper arrow on the screen to remove 80 mm of the filament. At first, extruder will load 40 mm to prevent clogging. Repeat if needed



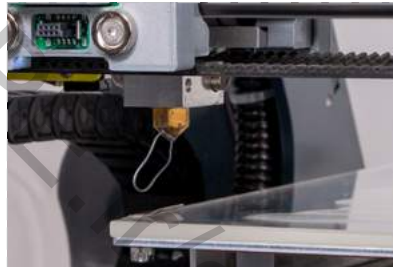
Insert the new filament gently into the guide.



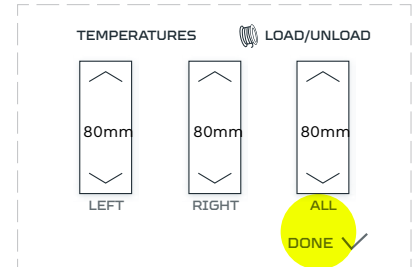
Tap the bottom 'LEFT' arrow on the screen if necessary to manually feed the filament.



Push the filament down until you feel it has been grabbed by the extruder drive gear.



Wait until the material flows out of the nozzle. Tap the feed button again if necessary.



Remove the extruded material. Click 'DONE', the extruder will continue to work from where it stopped.

## NOTE

Sometimes after clicking 'DONE' the machine won't resume the work, in those cases repeat the feeding by pressing one more time the 'LEFT' down button and after the extruder stops the feeding process press the 'DONE' button.



# 3D printing workflow

## 12.6 Automatic detection of missing filament

Single Extruder Toolhead 1.75 is equipped with filament sensor, which allows to detect missing filament during the print. This function will pause the print when the filament ends. After replacing the filament with a new one, the print will be resumed from the paused moment.

The material is running out.  
Preparing for filament change  
Please remove leftover material



Remove the leftover material.

When the extruder runs out of the filament during printing the Zmorph Fab automatically start the filament change procedure.

TEMPERATURES		LOAD/UNLOAD
TARGET		CURRENT
LEFT	0	23
RIGHT	0	0
BED	60	60

DONE ✓

The extruder will cool down automatically. Set the correct extruder temperature and go to the 'LOAD/UNLOAD' menu.

TEMPERATURES		LOAD/UNLOAD
TARGET		CURRENT
LEFT	200	40
RIGHT	0	0
BED	60	60

DONE ✓

Tap the 'LOAD/UNLOAD' menu and wait until the extruder reach the proper temperature.



Insert a new filament gently into the guide.

Please wait,  
loading material

The extruder will automatically start feeding the filament



Wait until the material flows out of the nozzle.

TEMPERATURES		LOAD/UNLOAD
LEFT	80mm	<input type="checkbox"/> UP <input checked="" type="checkbox"/> DOWN DONE ✓
RIGHT	80mm	
ALL	80mm	

Tap the feed button if necessary

TEMPERATURES		LOAD/UNLOAD
LEFT	80mm	<input type="checkbox"/> UP <input type="checkbox"/> DOWN DONE ✓
RIGHT	80mm	
ALL	80mm	

Remove the extruded material. Click 'DONE', the extruder will continue to work from where it stopped.

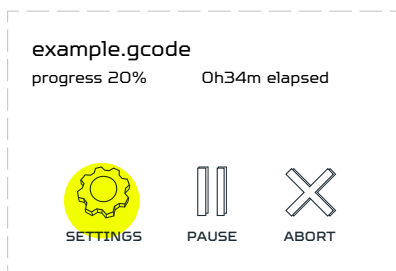
# 3D printing workflow

## NOTE

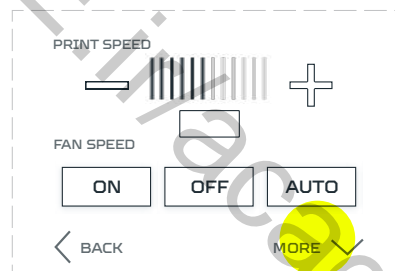
Sometimes after clicking 'DONE' the machine won't resume the work. In those cases repeat the feeding by pressing one more time the 'LEFT' down button and after the extruder stops the feeding process press the 'DONE' button.

## Dual Extruder Toolhead

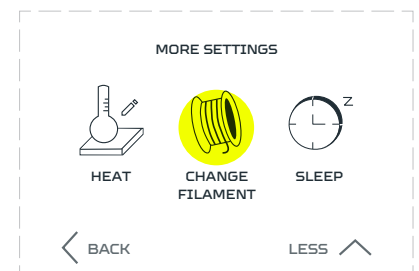
This function allows you to change the filament during the printing process. The new filament must be of the same material as the previous one (PLA/PLA) because the temperature of the extruder will be the same as for the filament that was there before.



Tap the 'SETTINGS' menu.



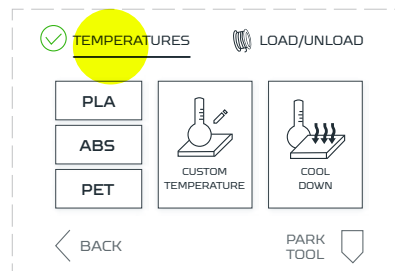
Choose 'MORE'.



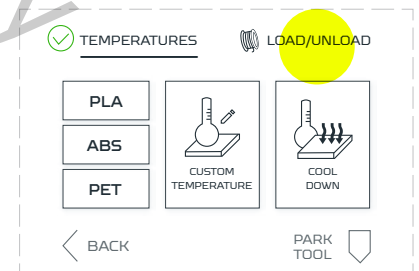
Choose 'CHANGE FILAMENT'.



Wait until the extruder stops printing and lifts itself up.

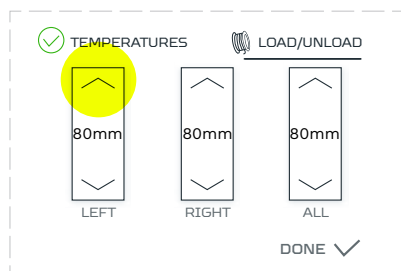


Tap the 'TEMPERATURES' menu and check if the extruder has the right temperature.

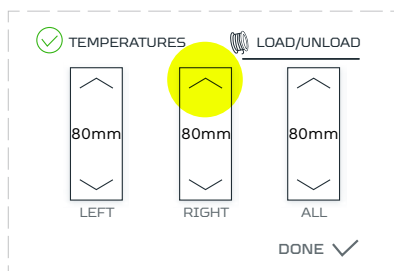


Tap the 'LOAD/UNLOAD' menu.

# 3D printing workflow



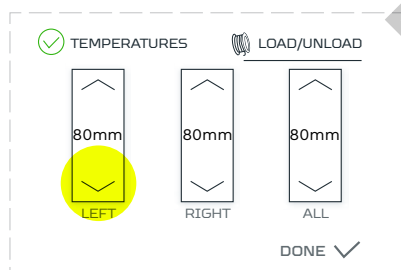
Tap the upper arrow with LEFT description on the screen to remove 80 mm of the filament. At first, the extruder will load 40 mm to prevent clogging. Repeat if needed.



Tap the upper arrow with RIGHT description on the screen to remove 80 mm of the filament. At first, the extruder will load 40 mm to prevent clogging. Repeat if needed.



Insert a new filament gently into the guide.



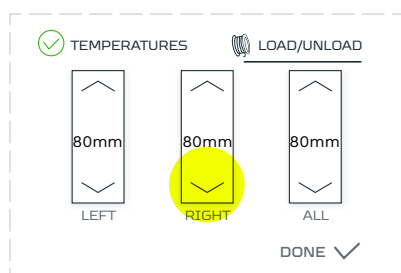
Tap the bottom arrow on the screen to feed 80 mm of the filament. Choose down arrow with LEFT description to do that.



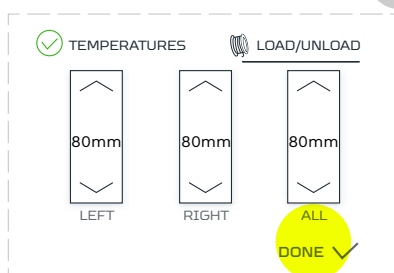
Push the filament down until you feel it has been grabbed by the extruder



Wait until the material flows out of the nozzle. Tap the feed button again if necessary



Repeat the last 4 steps for down arrow with RIGHT description.



Remove the extruded material. Choose 'DONE' and wait until the extruder starts printing again.

## NOTE

Sometimes after clicking 'DONE' the machine won't resume the work, in those cases repeat the feeding by pressing one more time the 'LEFT' down button and after the extruder stops the feeding process press the 'DONE' button.

# 3D printing workflow

## 12.7 Autocalibration

### Single Extruder Toolhead 1.75

**NOTE**

Before performing the automatic calibration make sure the worktable is clean and prepared.

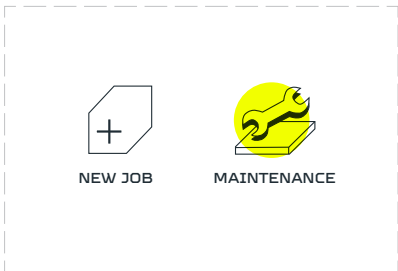
During the automatic calibration process the printer is heating up.



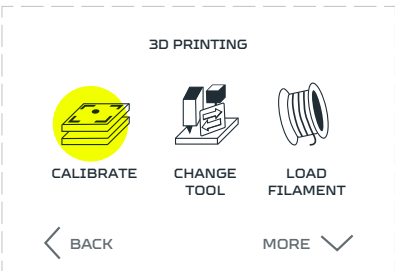
Connect the LEFT cable to the LEFT frame socket and RIGHT cable to the RIGHT frame socket.



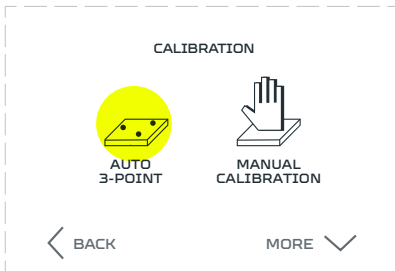
Connect the extruder 'A' cable to the 'A' plug and the 'B' cable to the 'B' plug on the X carriage.



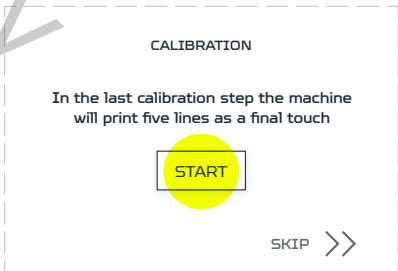
Choose 'MAINTENANCE'.



Choose 'CALIBRATE'.

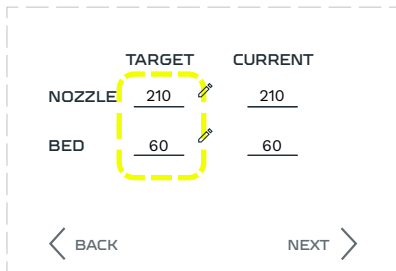


Choose 'AUTO 3-POINT'. Wait for the machine to heat up and finish the probing.



To ensure the best calibration result print calibration pattern. Choose 'START'.

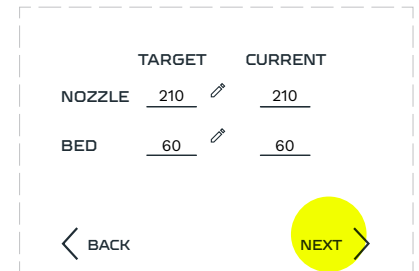
# 3D printing workflow



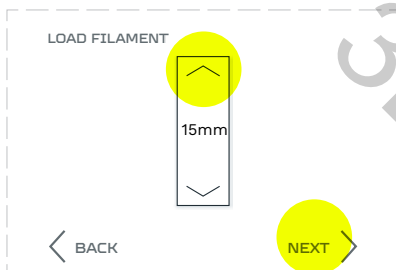
Set the printing temperature to the PLA material., Nozzle 210 °C, bed 60 °C.



To do that tap the gaps and type the temperature on the screen.



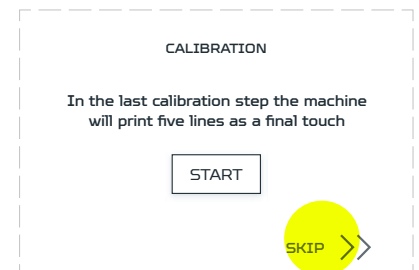
Wait for the extruder to heat up. When done tap 'NEXT'.



Use the arrow buttons on the screen to feed the material on the extruder until it start to pour out from the nozzle. (it might take a couple times), after that press the 'NEXT' button.



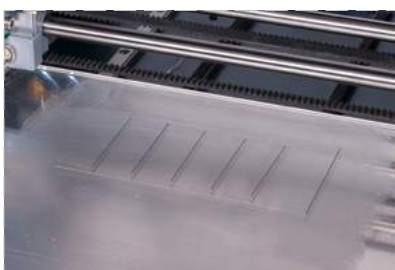
Wait for the machine to finish printing pattern.



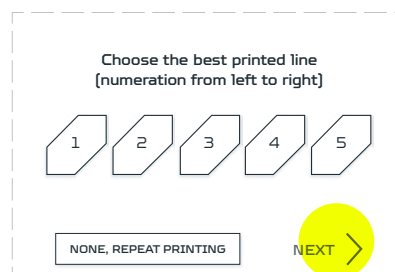
**NOTE:** by pressing the 'SKIP' button the user is approving the automatic calibration without visual validation. After that the calibration process ends.

## NOTE

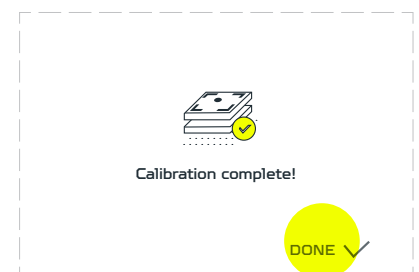
Each one of those lines is printed on a slightly different height (+/- 0.05 mm) with the middle line being the result of the automatic calibration process.



Look at the printed lines and select the best one on the screen. A correct line is the one that sticks to the table after gently touching it with the finger, but can be easily ripped off with a fingernail.



Apply your choice.



Zmorph Fab calibration is complete.

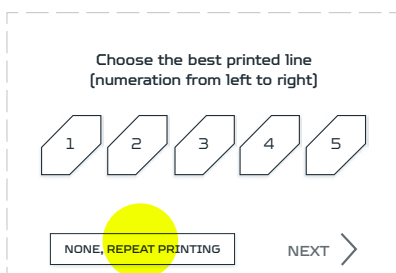
# 3D printing workflow



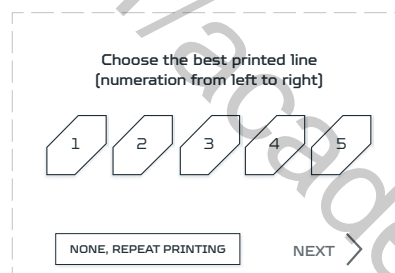
Clean the bed. Your machine is ready for your first print!

## NOTE

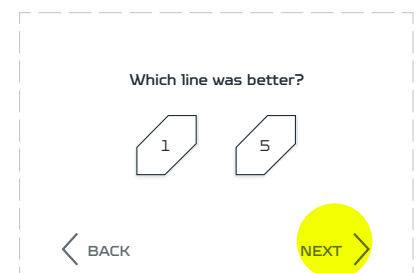
If none of the printed lines is proper, please follow these steps:



Choose 'NONE' option.



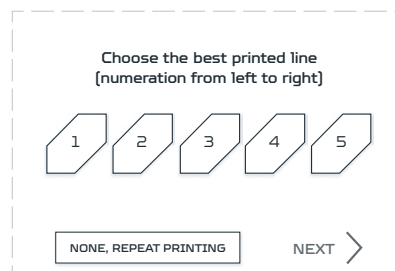
Tap 'NEXT'.



Printer will ask which of the line is closest to the best result 1 or 5. Pick one and tap 'NEXT'.



The machine will prepare another 5 lines, depending on the choice - lower (1) or higher (5).

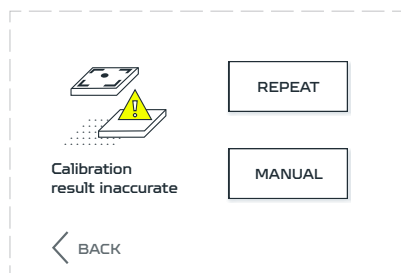


Select the best one by pressing their corresponding numbers visible on the screen and tap 'NEXT'.



Zmorph Fab calibration is complete.

# 3D printing workflow



If after the second round of calibration the user still decides that none of the lines are accurate, the machine will show a warning screen and advise to repeat the automatic calibration process or to perform the manual calibration.

## NOTE

If meeting calibration issues or autocalibration doesn't work, please contact Technical Support.

## Dual Extruder Toolhead

## NOTE

Before performing the automatic calibration make sure the worktable is clean and prepared.

See the toolhead changing process before mounting the Dual Extruder Toolhead on the machine.

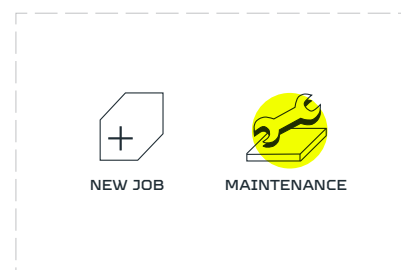
During the automatic calibration process the printer is heating up.



Connect the LEFT cable to the LEFT frame socket and RIGHT cable to the RIGHT frame socket.



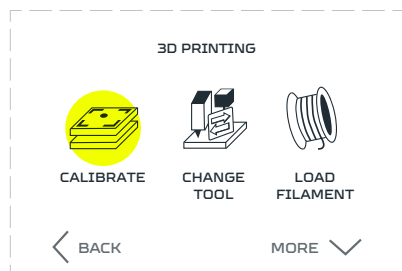
Connect the extruder 'A' cable to the 'A' plug and the 'B' cable to the 'B' plug on the X carriage.



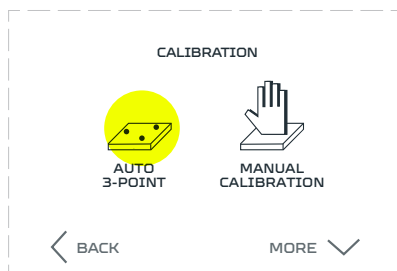
Choose 'MAINTENANCE'.



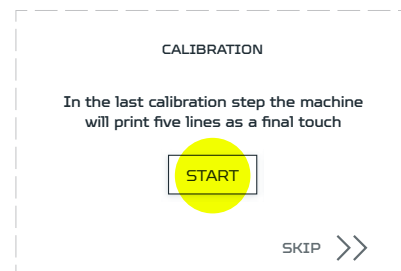
# 3D printing workflow



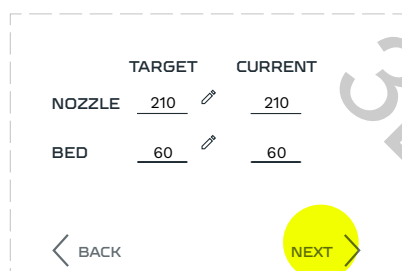
Choose 'CALIBRATE'.



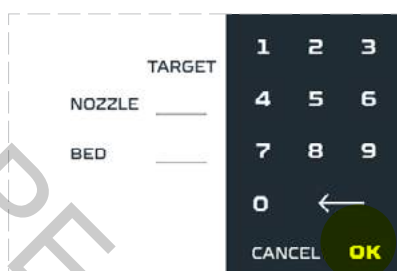
Choose 'AUTO 3-POINT'. Wait for the machine to heat up and finish the probing.



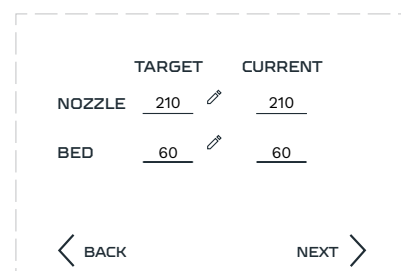
To ensure the best calibration result print calibration pattern. Choose 'START'.



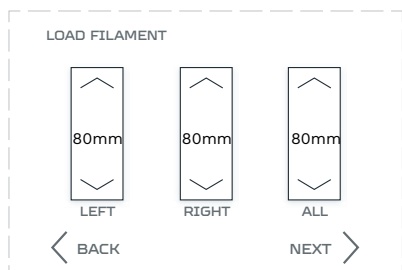
Set the printing temperature to the PLA material. Nozzle 200 °C, bed 60 °C.



To to that tap the gaps and type the temperature on the keyboard.



Wait for extruder to heat up. When done tap 'NEXT'.



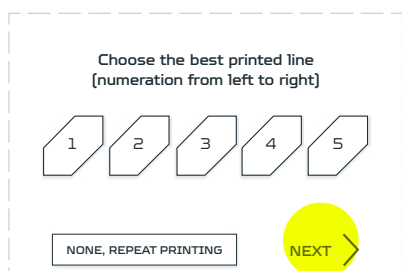
Use the arrow buttons on the screen to feed the material on both sides of the extruder until it start to pour out from the nozzle. (it might take a couple times), after that press the 'NEXT' button.



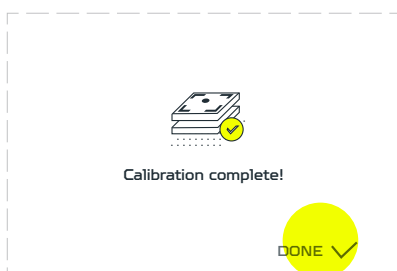
Wait for the machine to finish printing pattern.



Look at printed lines and select the best one on the screen. A correct line is the one that sticks to the table after gently touching it with the finger, but can be easily ripped off with a fingernail.



Apply your choice.



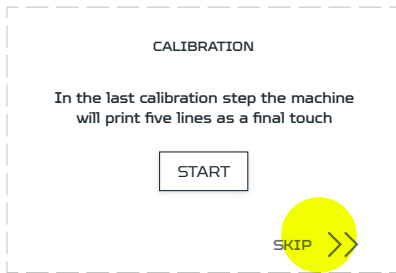
Zmorph Fab calibration is complete.



Clean the bed. Your machine is ready for your first print!



# 3D printing workflow

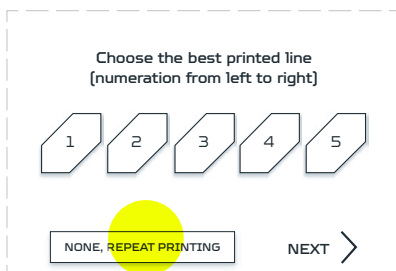


**NOTE:** by pressing the 'SKIP' button the user is approving the automatic calibration without visual validation. After that the calibration process ends.

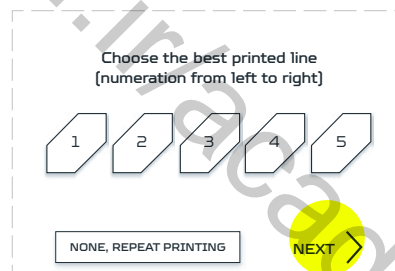
## NOTE

Each one of those lines is printed on a slightly different height (+/-0.05 mm) with the middle line being the result of the automatic calibration process.

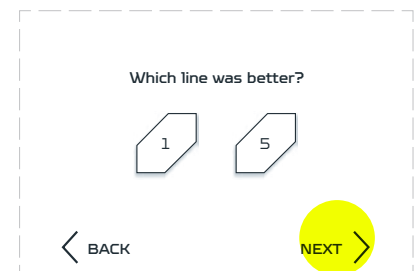
If none of the printed lines is proper, please follow these steps:



Choose NONE option.



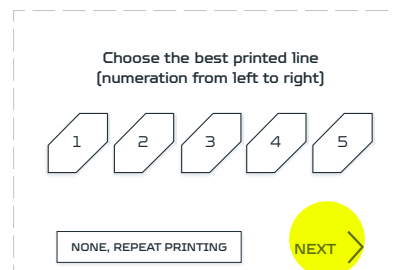
Tap 'NEXT':



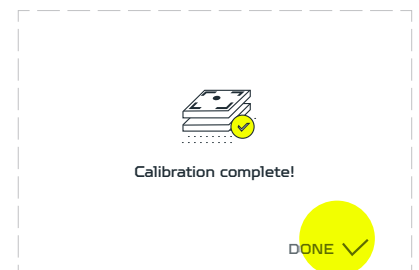
Printer will ask which of the line is closest to the best result 1 or 5. Pick one and tap 'NEXT'.



Printer will prepare another 5 lines lower or upper according to your choice. Each line is printed 0.05 mm lower/upper according to user choice.

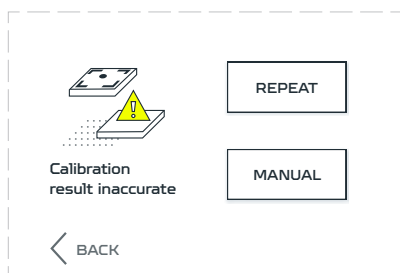


Pick the best line and 'NEXT':



Calibration completed.

# 3D printing workflow



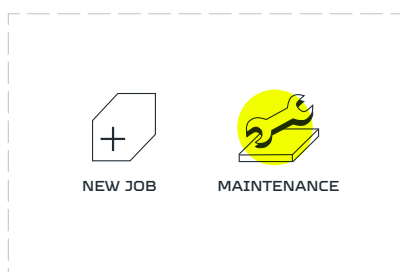
If after the second round of calibration the user still decides that none of the lines are accurate, the machine will show a warning screen and advise to repeat the automatic calibration process or to perform the manual calibration.

## NOTE

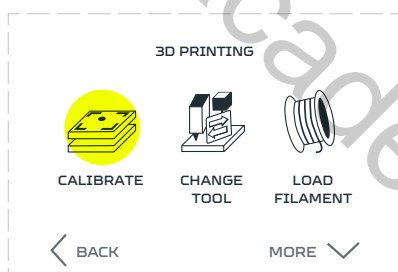
If meeting calibration issues or autocalibration doesn't work, please contact Technical Support

## 12.8 Manual calibration process

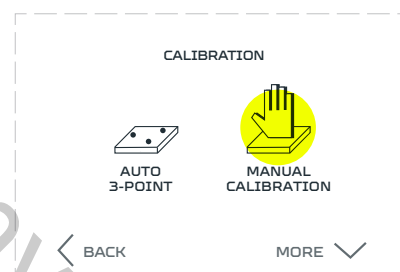
The manual calibration doesn't require loading a filament (can be performed with an empty extruder).



Choose 'MAINTENANCE'.



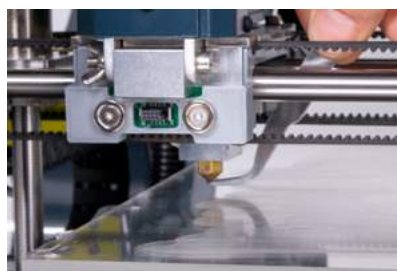
Choose 'CALIBRATE'.



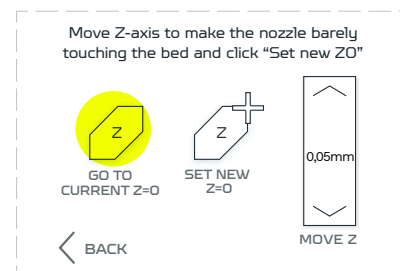
Choose 'MANUAL CALIBRATION'.



Wait until the extruder is placed in the right place.



Clear the nozzle and the table from the unnecessary material.

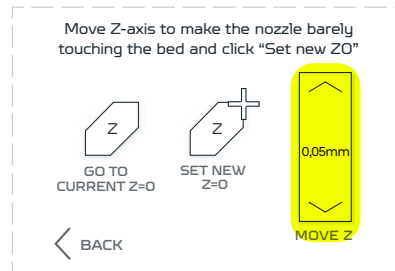


Take a small sheet of paper and place it between the nozzle and the worktable. Press the 'GO TO CURRENT Z0' button.

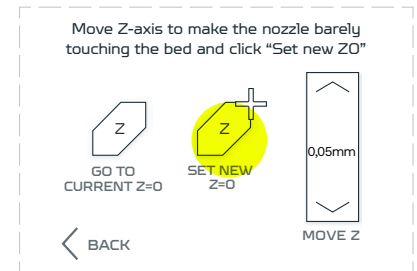
# 3D printing workflow



Wait until the extruder stabilizes itself on the right height.



Use arrows on the touch-screen to lower or raise the extruder by 0.05 mm.



When the nozzle is at the correct height, choose 'Set new Z0' (Visual or paper verification).

## NOTE

Move the paper between the nozzle and the worktable surface, if the nozzle is too low the paper won't move. If the nozzle is too high above the surface the paper sheet will be loose. The best configuration is when the piece of paper rubs against the nozzle but it's not too loose.

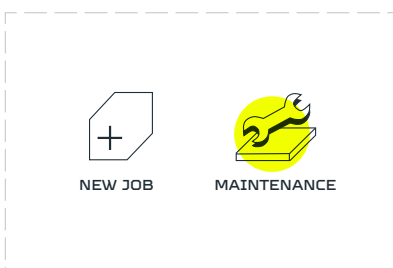
Be very careful using the 'Move Z-axis' feature, the movement of the Z-axis is slow and silent, don't press the arrow to many times because it might damage the work table glass surface.

## 12.9 Calibration - additional functions

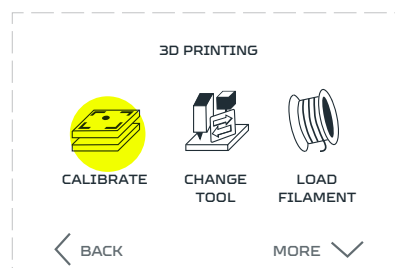
In the Maintenance Menu in Calibration Function there is an additional menu with advanced settings:

- Restore factory default - restores the factory default position and removes the history of calibration Z-axis changes.
- Manual 3-point calibration - an option for manual calibration the same 3 points that are used for autocalibration.

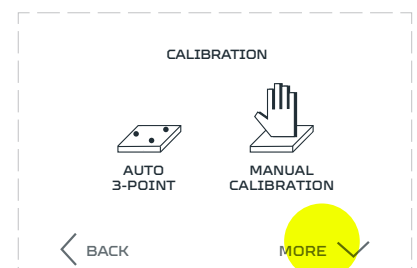
### Manual 3-point calibration



Choose 'MAINTENANCE'.

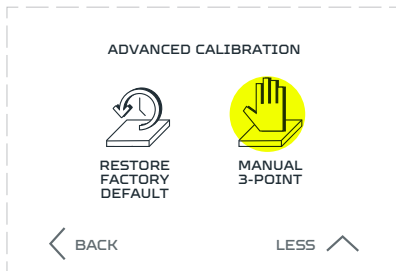


Choose 'CALIBRATE'.



Choose 'MORE'.

# 3D printing workflow



Choose 'MANUAL 3-POINT CALIBRATION'.



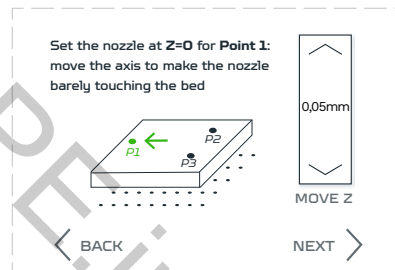
Wait until the extruder reaches the calibration position, on the left central part of the worktable.



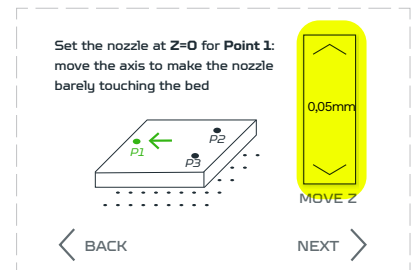
Clean the nozzle and table from unnecessary material.



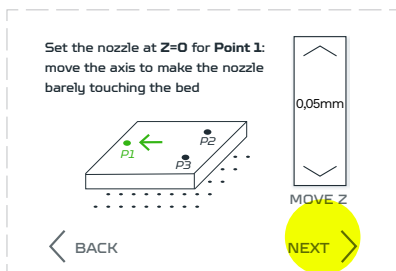
Take a small sheet of paper and place it between the nozzle and the worktable. Set the nozzle at Z=0 for the Point1.



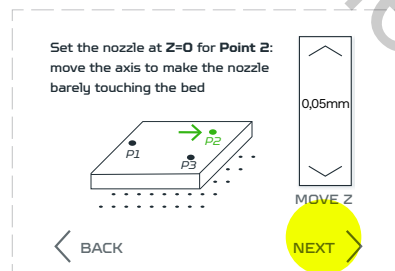
Set the nozzle at Z=0 for the Point1: move the axis to make the nozzle barely touching the bed.



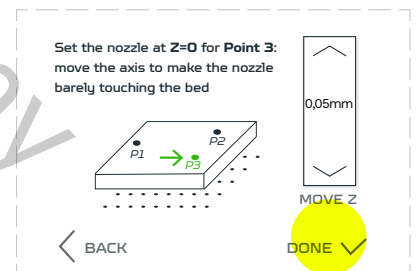
Use the arrows to set position. To verify the distance, you should be able to place a sheet of paper underneath



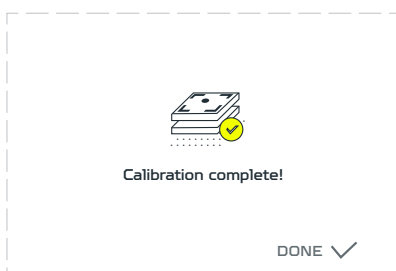
When done, tap 'NEXT'.



Repeat for point number 2 and 3.



When finished tap 'DONE'.



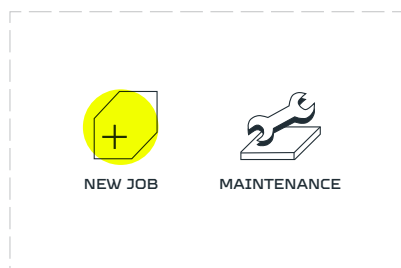
Manual 3-point calibration process is finished!

## NOTE

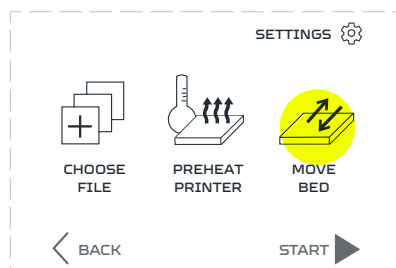
Move the paper between the nozzle and the worktable surface. If the nozzle is too low, the paper won't move. If the nozzle is too high above the surface the paper sheet will be loose. The best configuration is when the piece of paper rubs against the nozzle but it's not loose.

# 3D printing workflow

## 12.10 Preparing the worktable



Choose 'NEW JOB'.



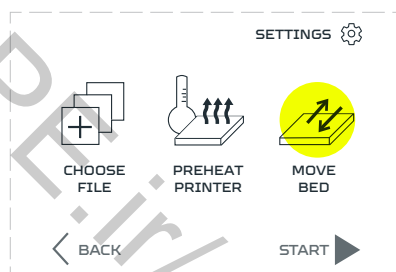
Choose 'MOVE BED'.



Wait until the worktable stops.



Positioning the worktable works in two variants: to the front and to the back of the machine.



The variants are changing with every click on 'MOVE BED' option.



Clean the surface of the table and remove all greasy spots. We recommend paper towel and a window cleaner.



Apply a thin layer of an adhesive agent to the worktable. The table is ready for 3D printing.

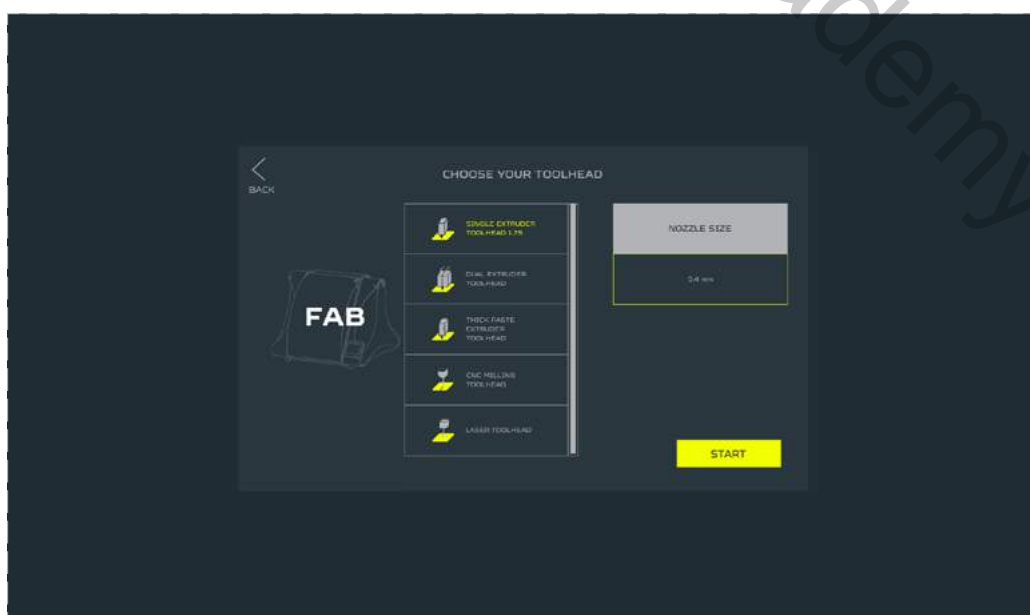
# 3D printing workflow

## 12.11 Files preparation

### Single Extruder Toolhead 1.75



Launch Voxelizer select the model of your printer, when done a new settings column will appear.

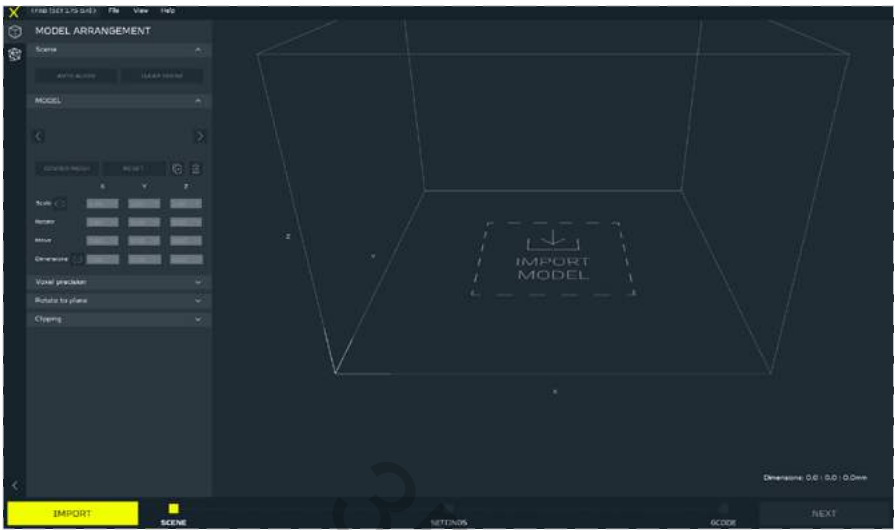


Choose Single 1.75 mm extruder.

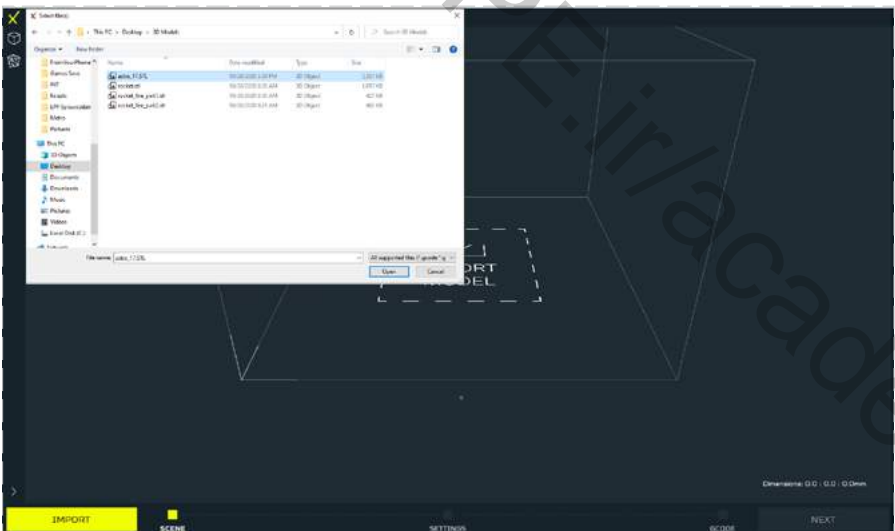
Choose nozzle 0.4 mm. This nozzle is mounted in extruder as a default.

Choose START.

# 3D printing workflow



Import your file by pressing the IMPORT button or the IMPORT MODEL sign on the table.



Select a STL file.

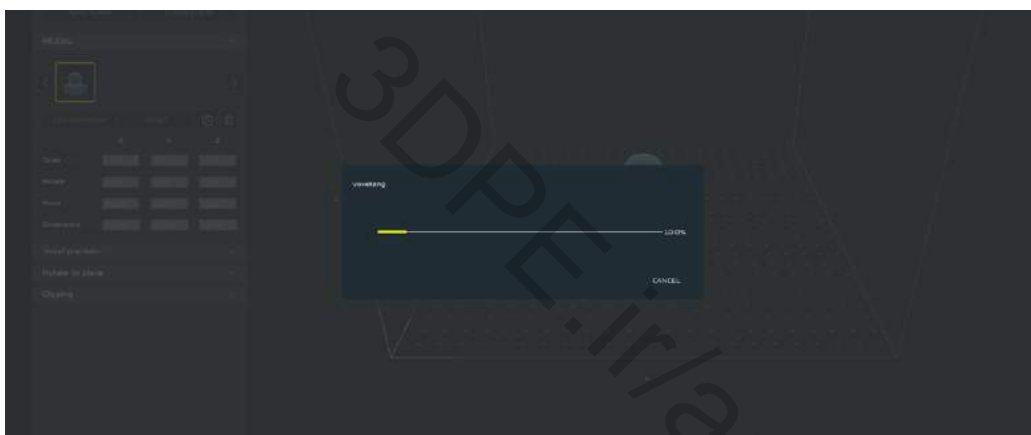


After importing the file, a toolbar will appear on the left that allows basic operations on the mesh model, such as: scaling (SCALE), scaling to specific dimensions (DIMENSION), rotating (ROTATE), and moving the model to specific position (MOVE).

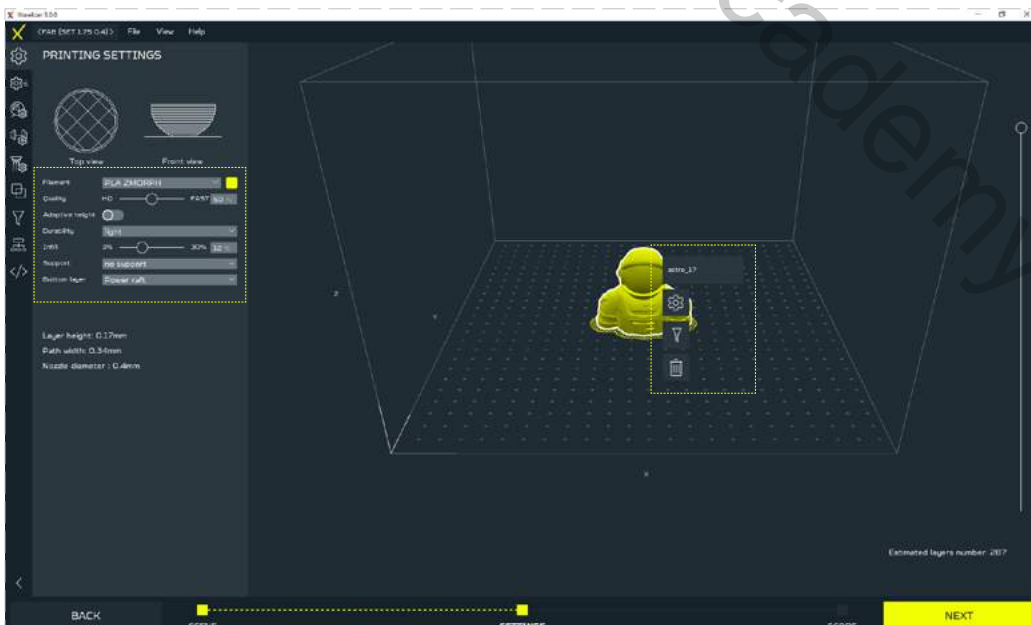


# 3D printing workflow

You can set values manually or use sliders.



Set the model according to your preferences and click NEXT to voxelize the model.



There are 2 types of menus - global (placed to the left of the screen) and local (opened by clicking the right mouse button on the model).

## NOTE

There can be many different unbound models on the workspace, by clicking the right mouse button on them different printing parameters can be selected for each of them.

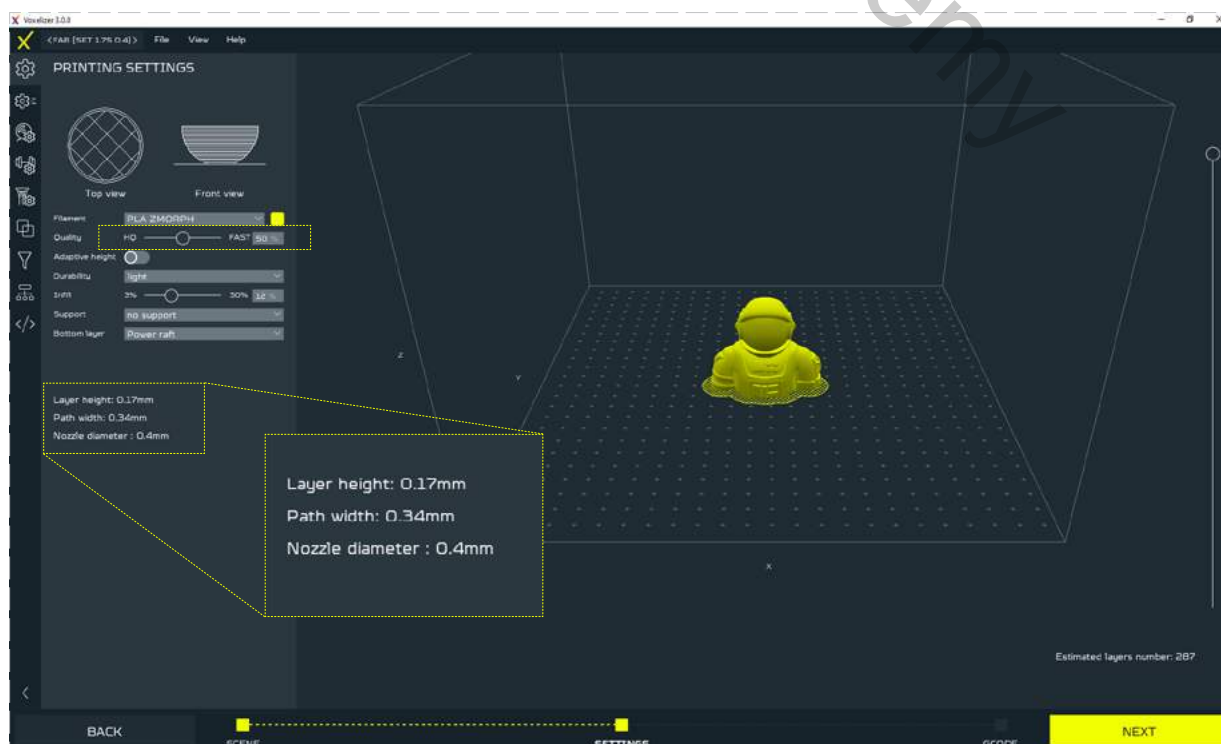
# 3D printing workflow

In the global menu you can set:

**Filament** - defines a filament type that will be used in the project, e.g: PLA ZMorph, ABS ZMorph, PET ZMorph. Basing on the filament choose, Voxelizer will adapt printing settings. To see the details of the print settings, click the button SEE MORE or go to Filament preset list.

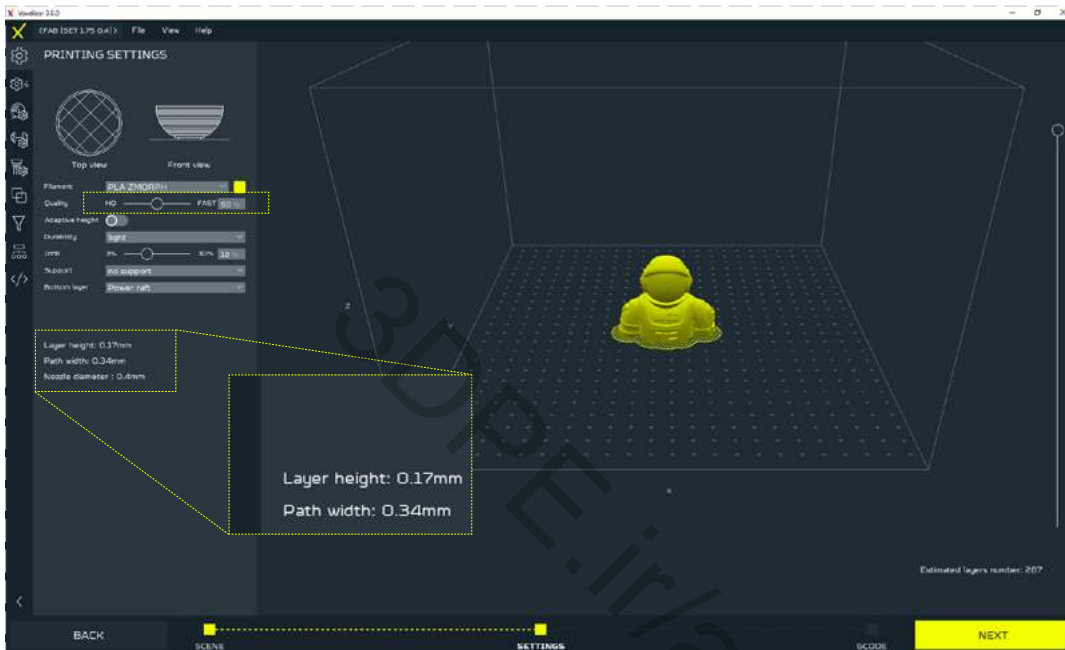


**Quality** - is a simplified option to select model quality settings, allowing you to select layer height and path width with a single slider. HQ guarantees the highest quality, at the expense of the print speed (lasts longer), while FAST guarantees a faster printout, at the expense of a larger layer, and thus lower quality. Recommended settings of 50% guarantee the best quality to print speed ratio. The current path values and layer height are shown under the basic menu. Quality can also be defined separately for different models, editing takes place in the local menu.



# 3D printing workflow

**Adaptive height** - option to enable or disable the height of the Adaptive Layer. This function allows the program to adjust the height of the print layer depending on the geometry of the model. The path width and default layer height values change to ranges that can be modified again using the Quality slider.



**Durability** - settings for the durability of the model. This function takes into account the number of model outlines as well as the scope and type of the infill.

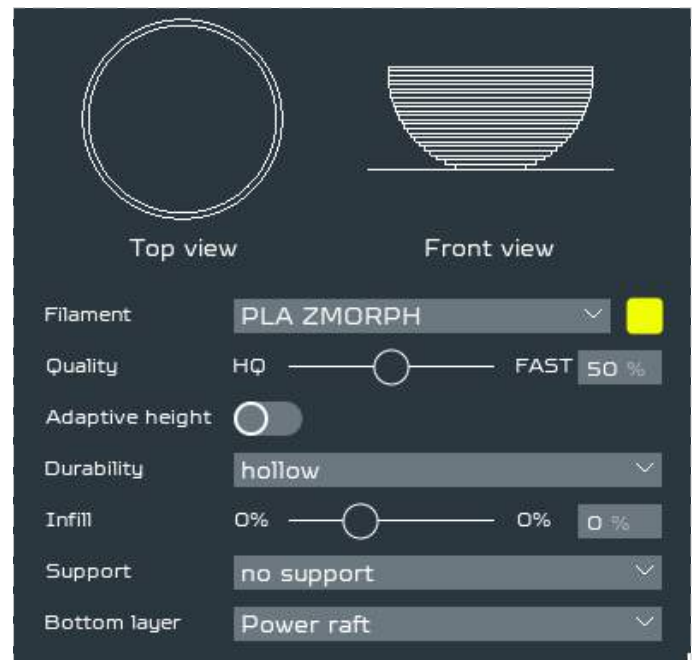
**There are 5 types:**

- **Adaptive** - allows for infill optimization and faster print. Imposes 2 outlines and 40-80% infill.



# 3D printing workflow

- **Hollow** - Imposes 2 outlines and 0% infill. Option for hollow models.



- **Light** - imposes 2 outlines and 3-30% grid-type infill.



# 3D printing workflow

- **Light honeycomb** - imposes 2 outlines and 3-50% honeycomb-type infill.

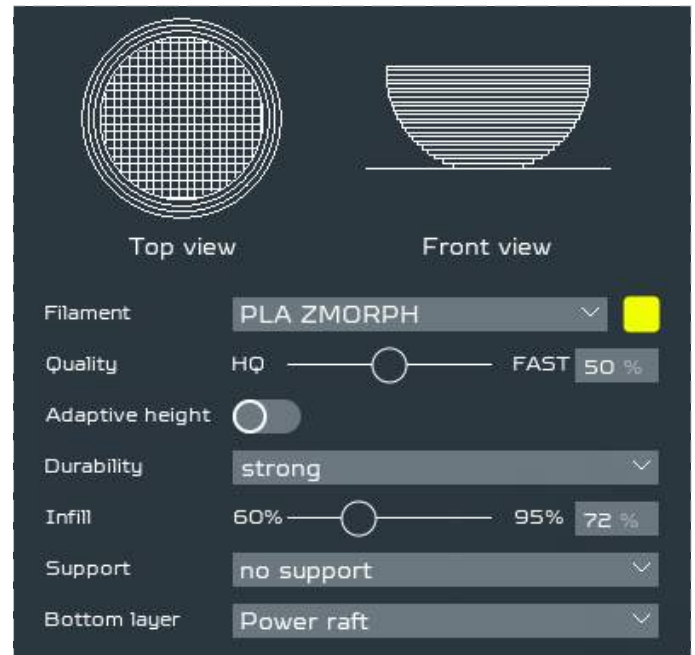


- **Medium** - imposes 3 outlines and 30-60% honeycomb-type infill.

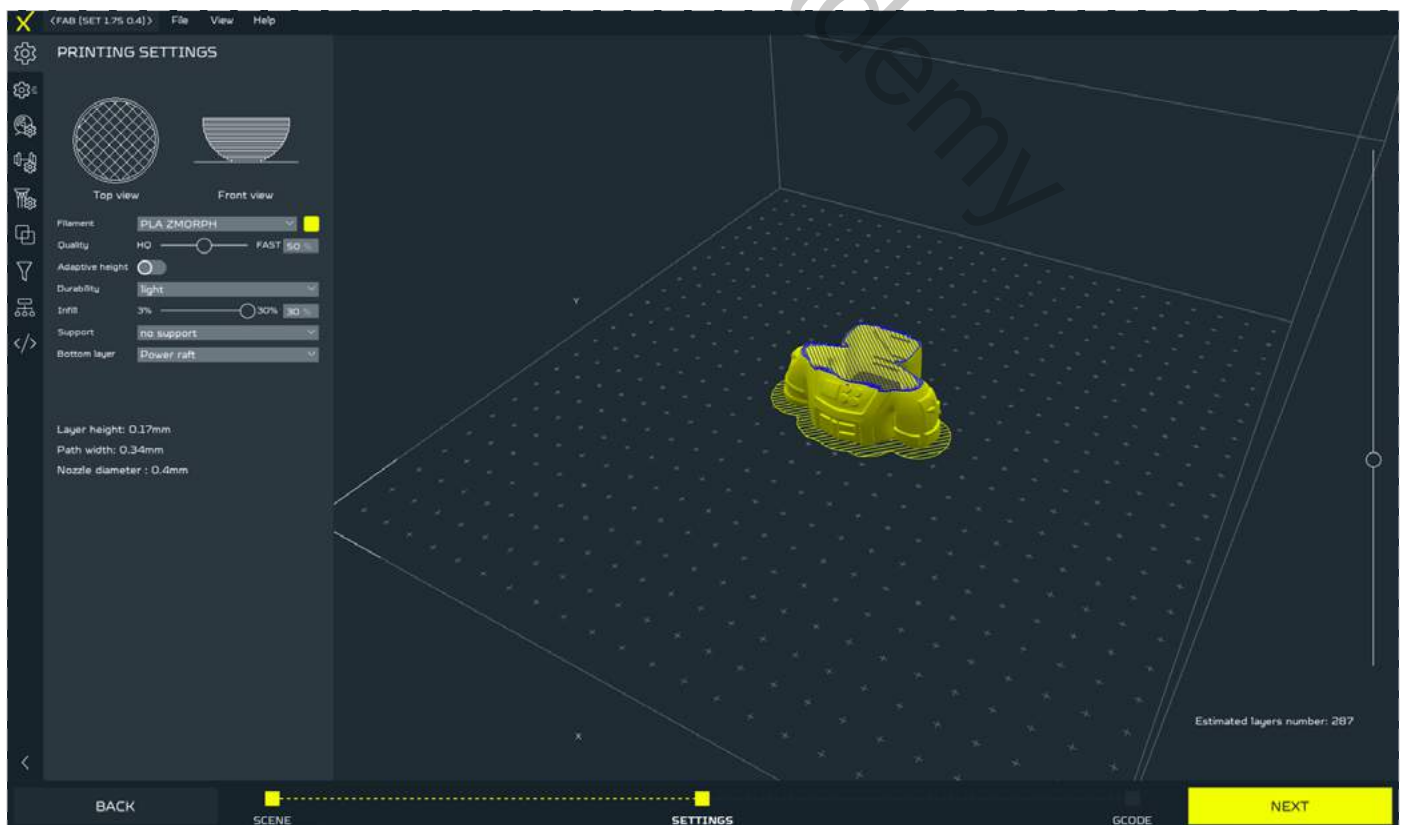


# 3D printing workflow

- **Strong** - imposes 4 outlines and 60-95% grid-type infill.



**Infill** - selection of model infill value within the range defined by Durability. The setting can be edited using the slider or entered manually. Generating a preview of the infill is performed on an ongoing basis, which allows for a quick assessment of the selected type and size of infill.



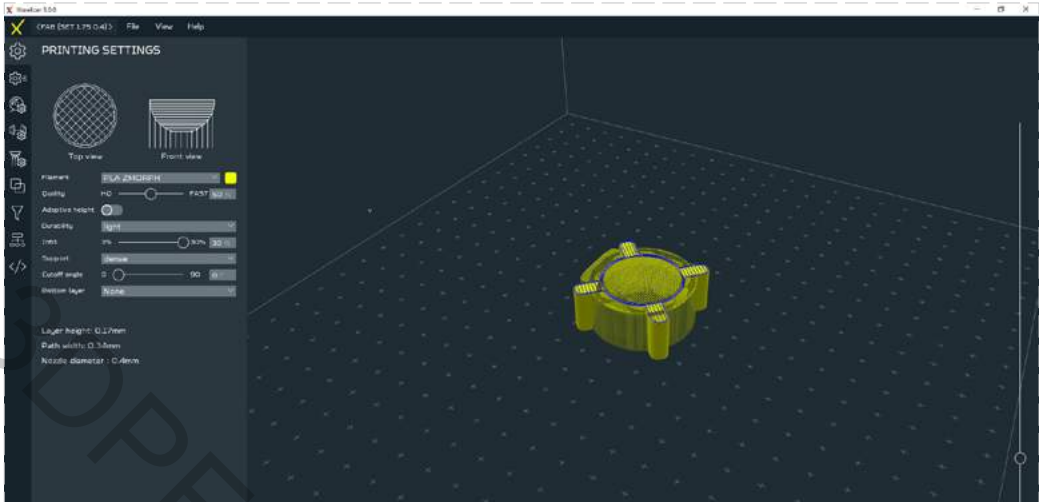


# 3D printing workflow

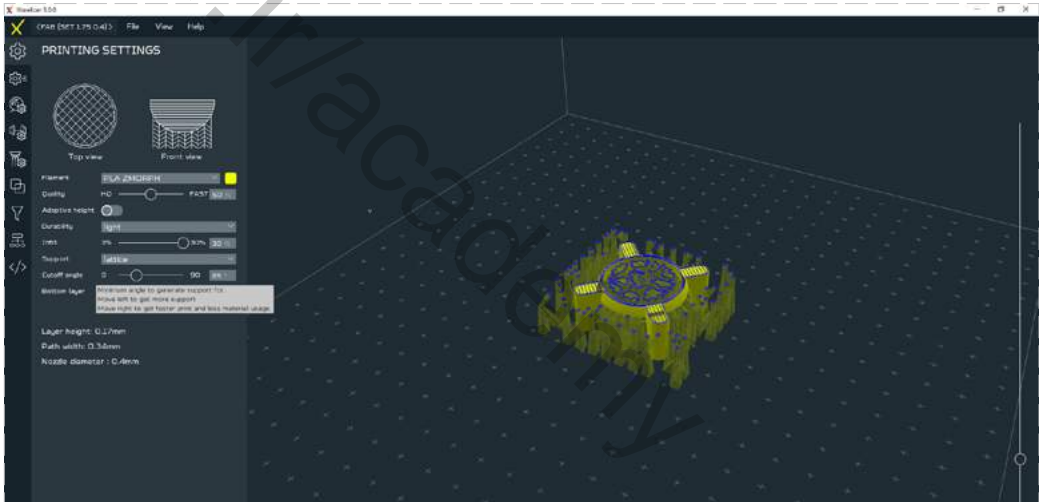
**Support** - enable/disable the support structure.

**There are 6 types of support:**

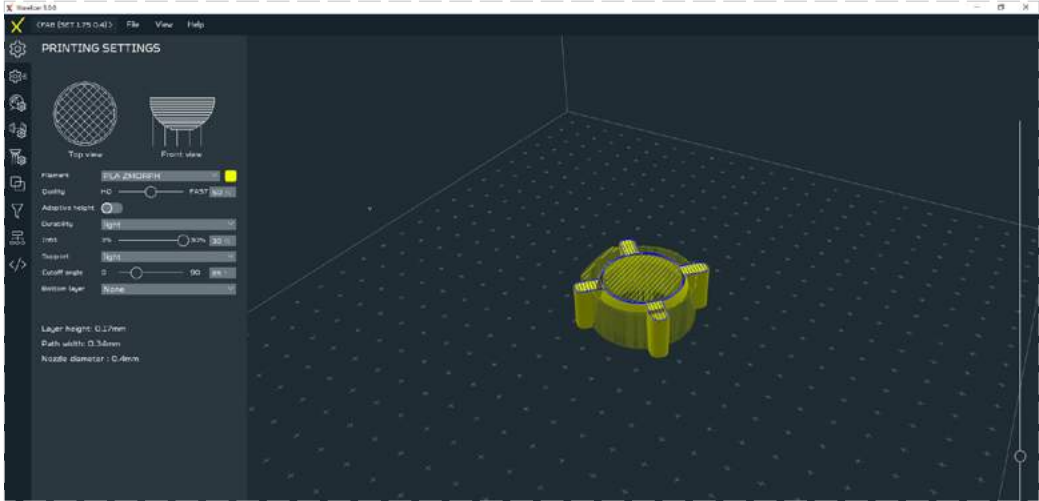
■ **Dense**



■ **Lattice**



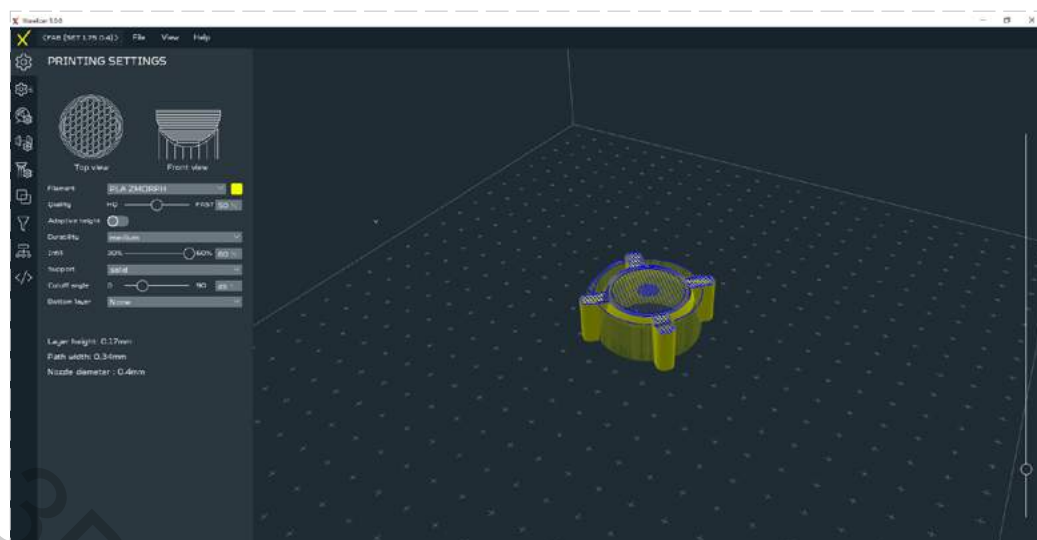
■ **Light**





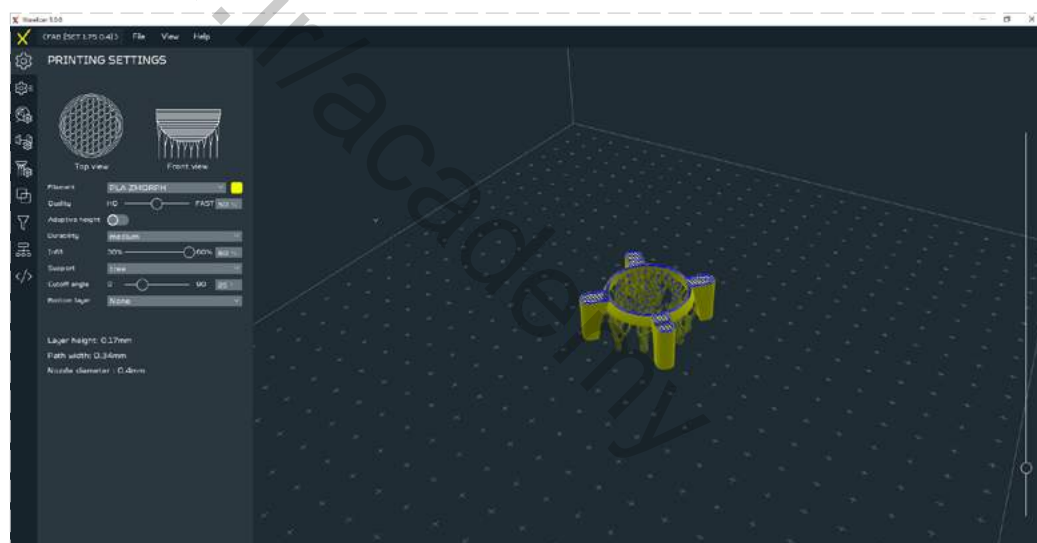
# 3D printing workflow

- Solid



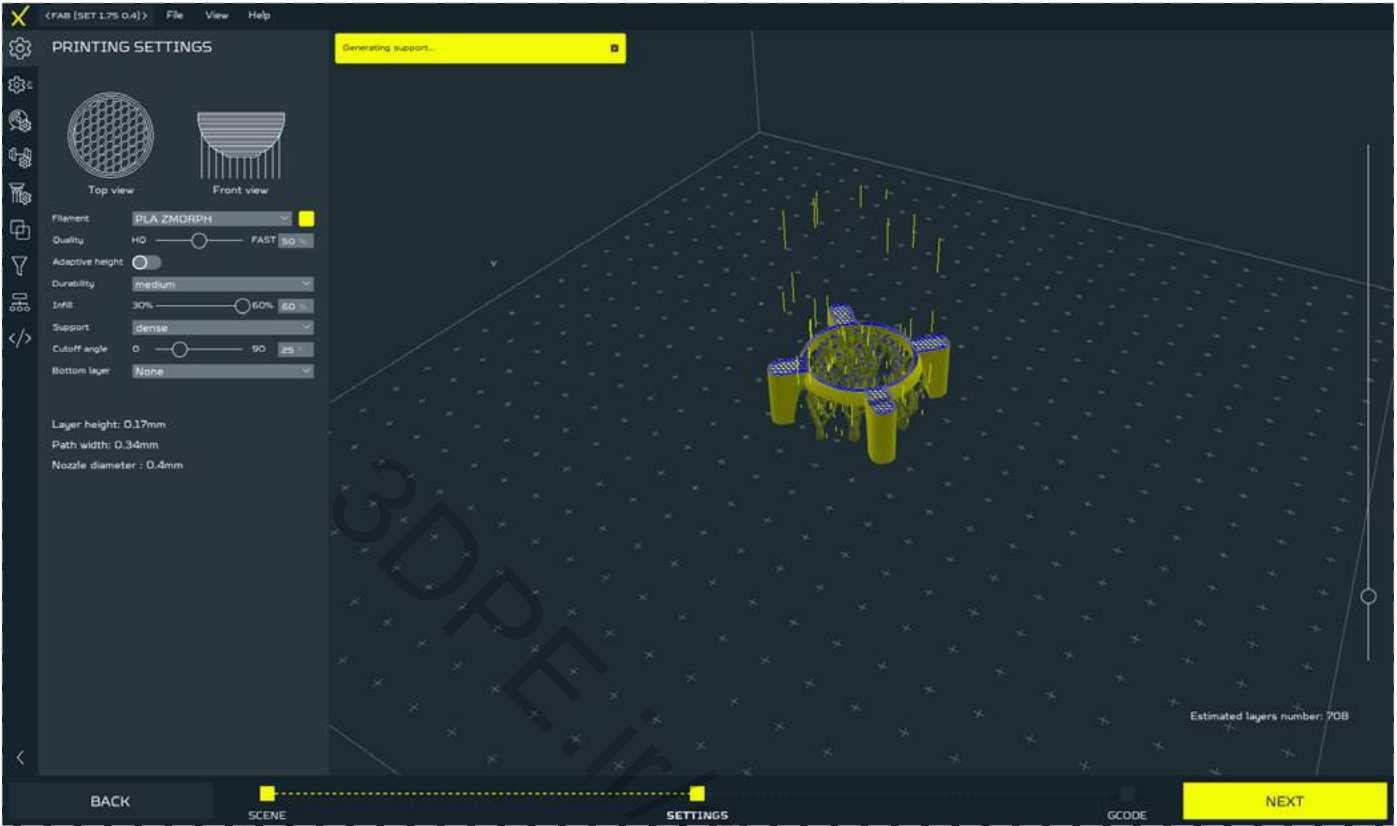
- Solid PVA - support dedicated for Dual Extruder Toolhead

- Tree

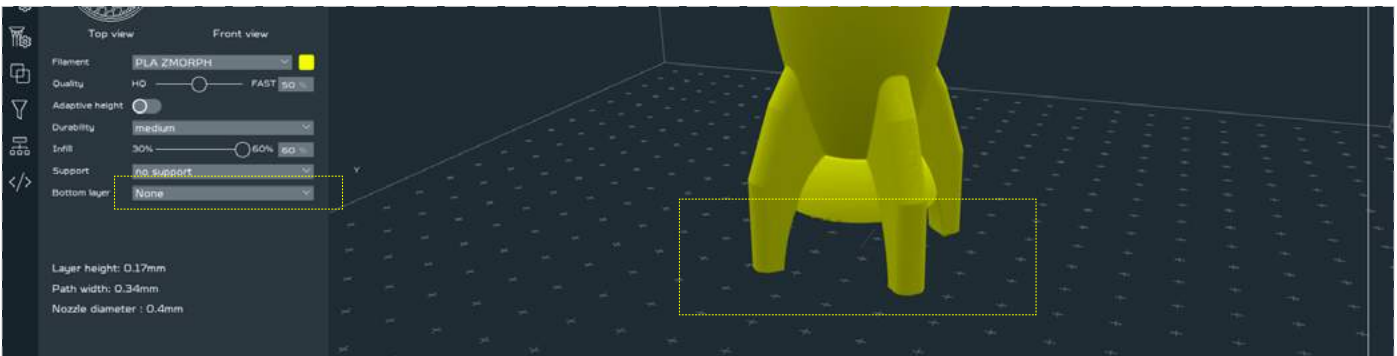
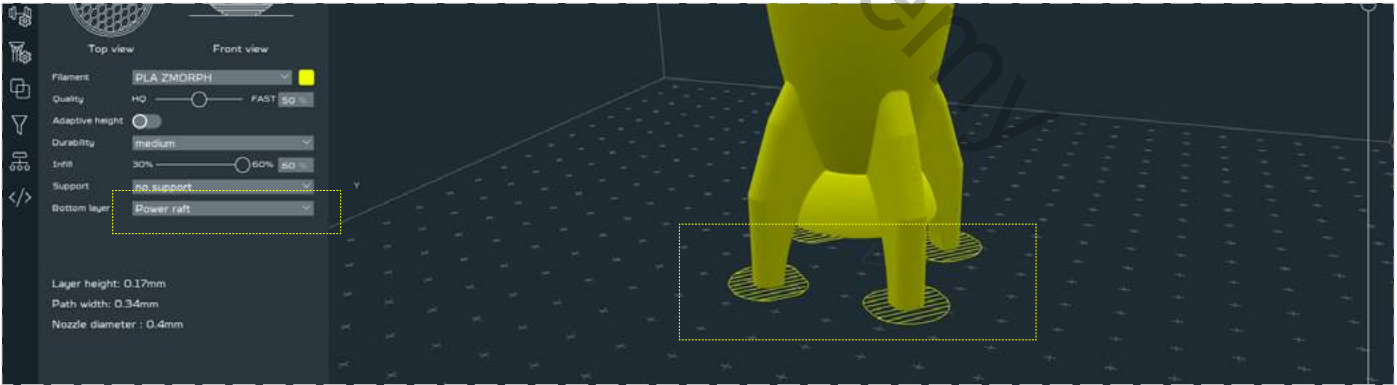


After selecting any of the support, a window appears to define the angle of inclination of the wall under which the support should be generated. This is the minimum angle value for the creation of support structures. Slide left for more support, right for less support.

# 3D printing workflow

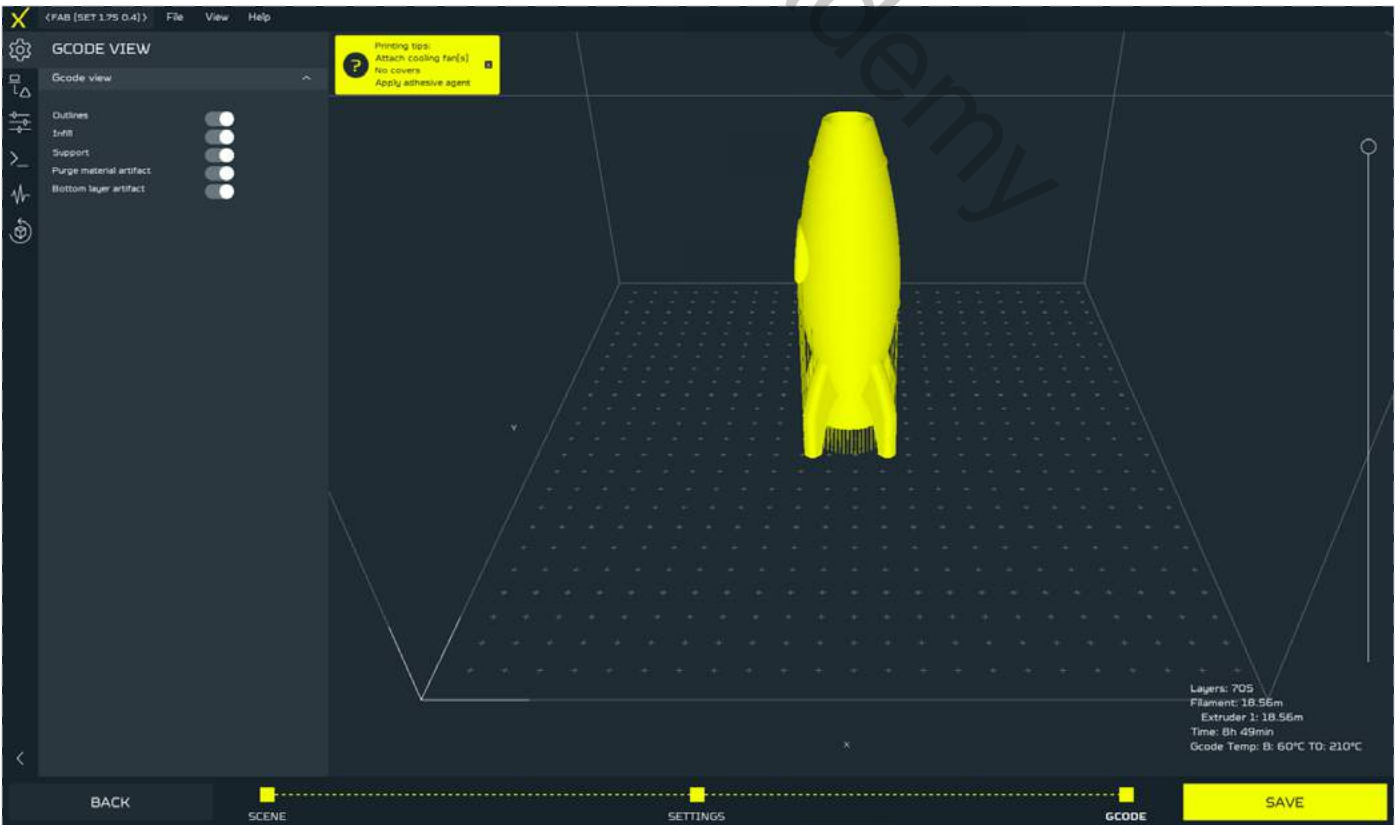
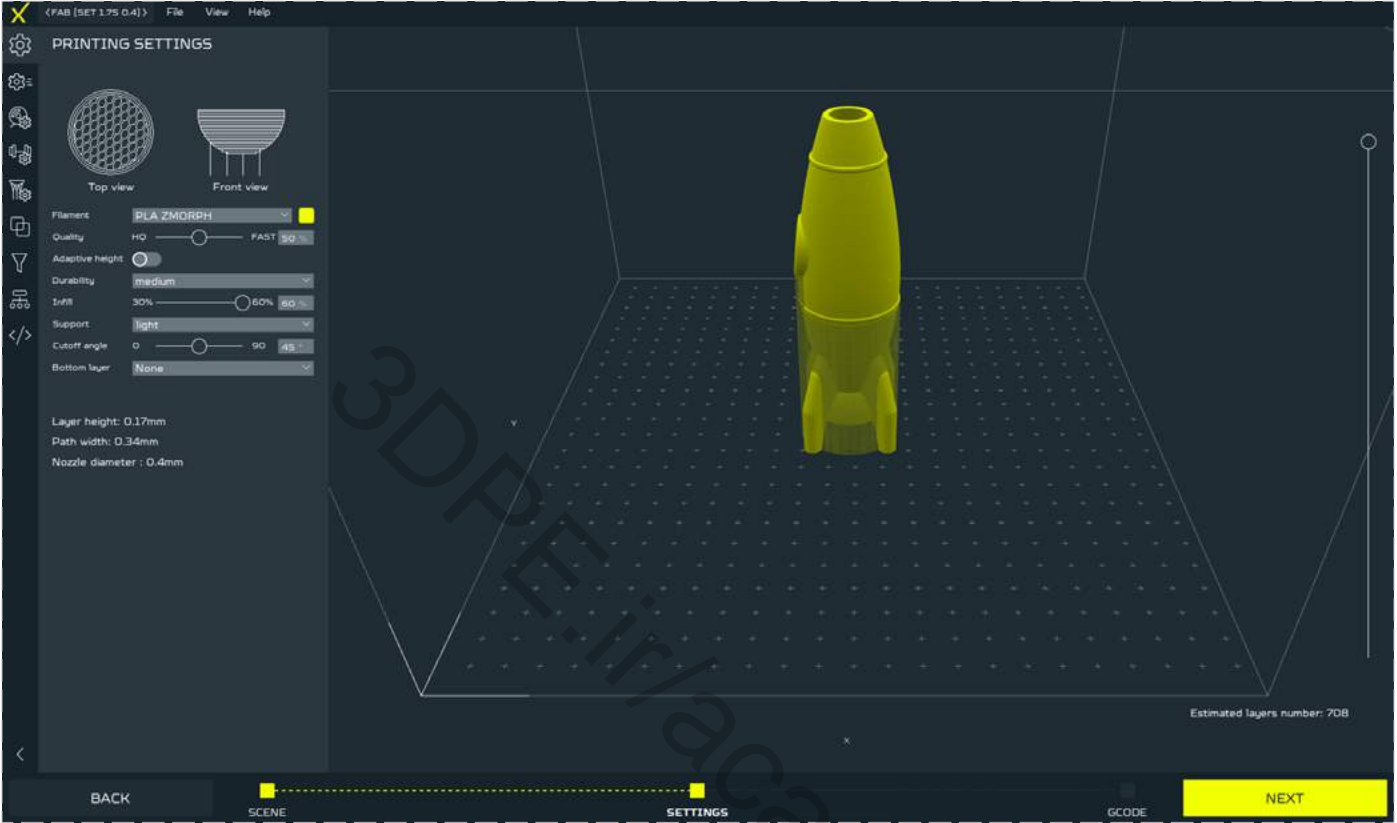


**Power raft** - an option used to enable/disable power raft, i.e. a platform that increases the adhesion of the printout to the work table.



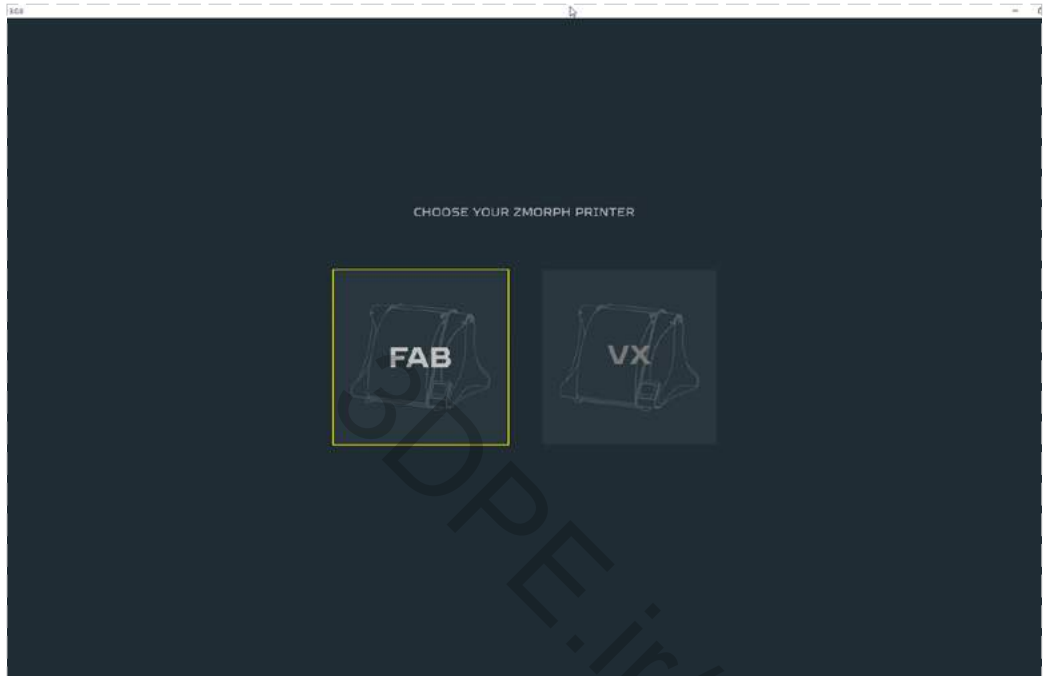
# 3D printing workflow

After all the parameters are set, click NEXT. The model is subjected to slicing and as a result .gcode file is generated. To save it, use the SAVE button.

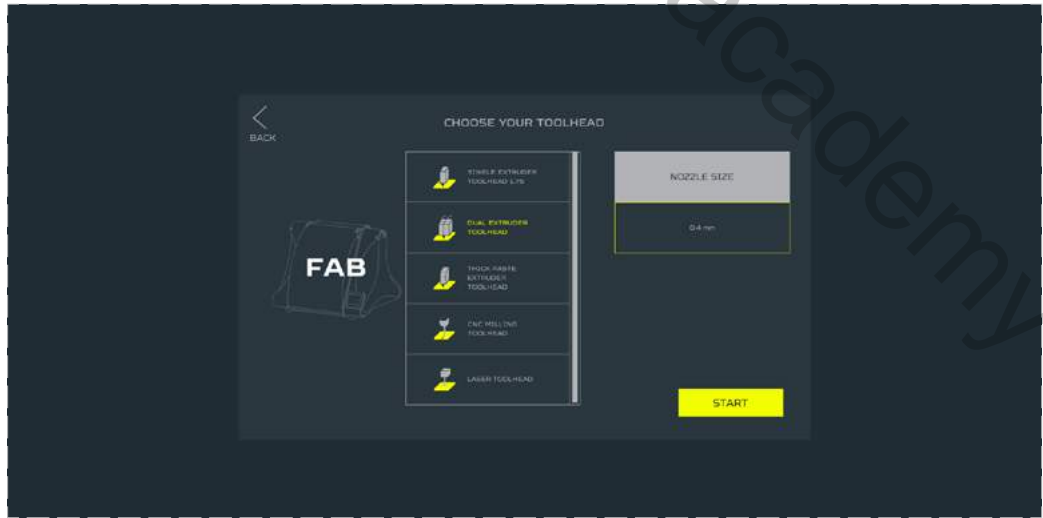


# 3D printing workflow

## Dual Extruder Toolhead



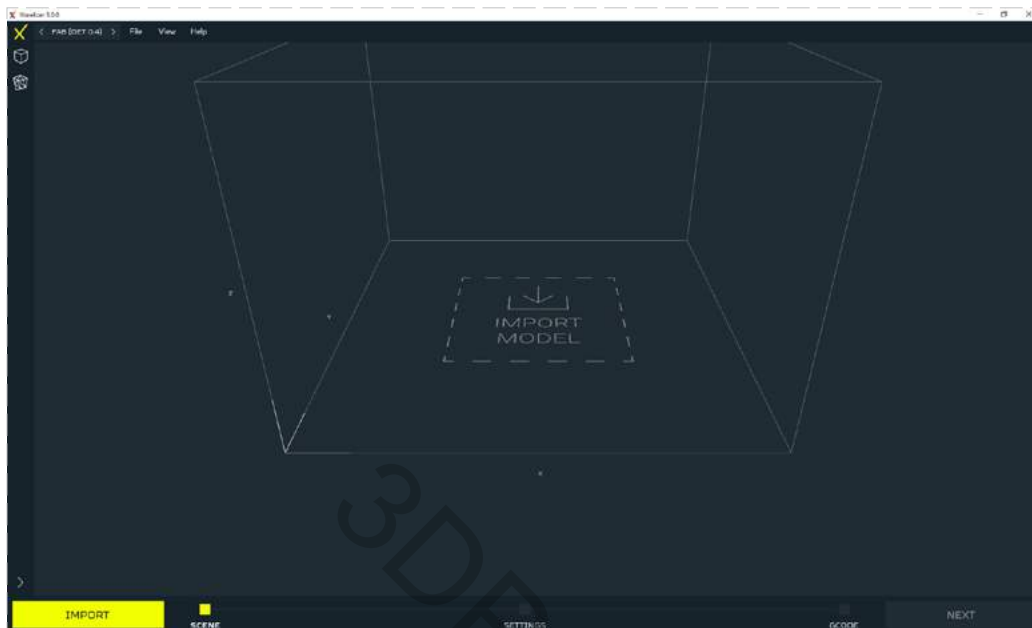
Launch Voxelizer, select the model of your printer, when done a new settings column will appear.



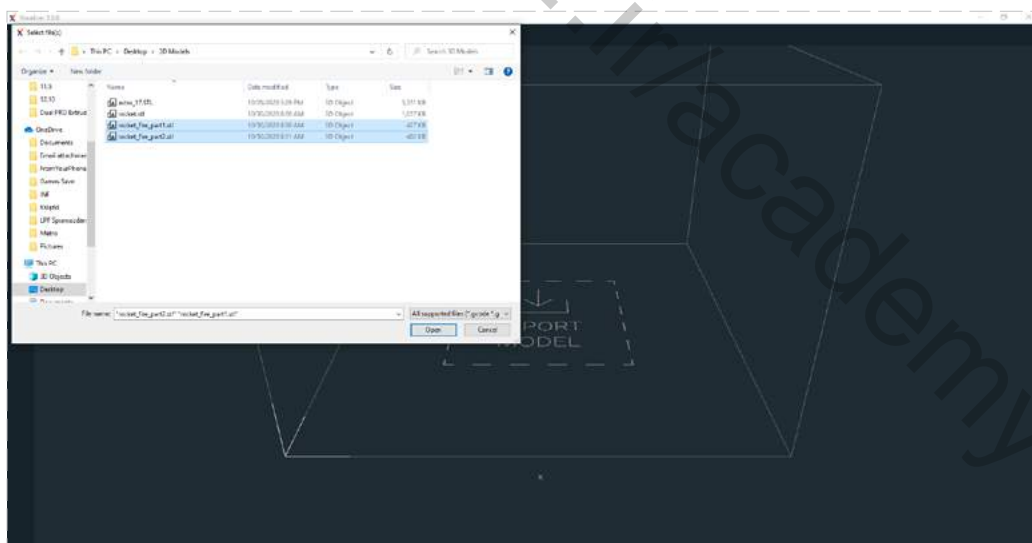
Choose Dual Extruder Toolhead, use arrows to show more toolheads. The default type of the nozzle is 0.4 mm.

Choose 'START'.

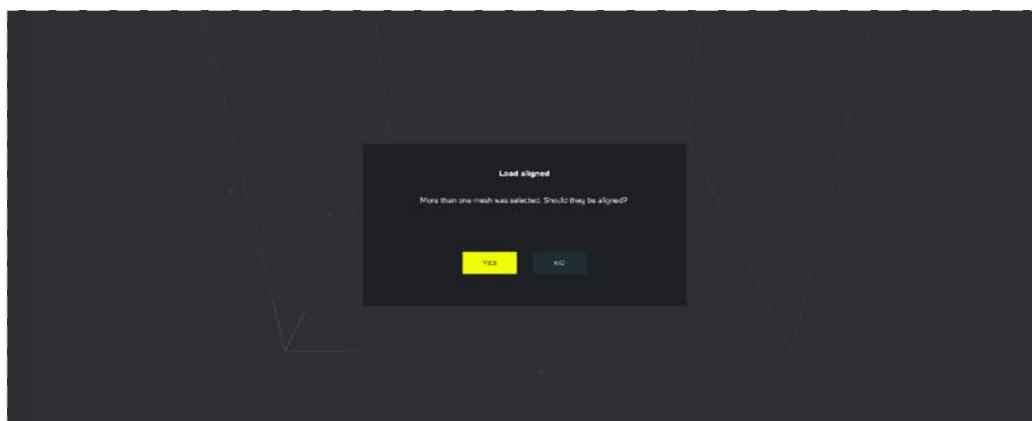
# 3D printing workflow



Import your file by pressing the IMPORT button or the IMPORT MODEL sign on the table.

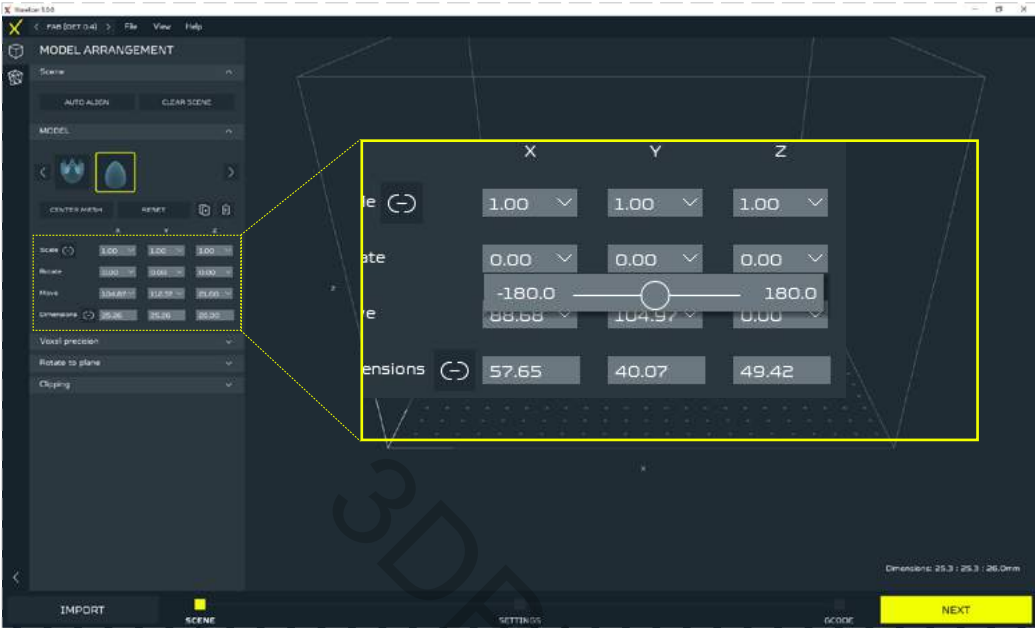


Select two STL models.



The software will ask if the models should be aligned. If the models were prepared in correct - aligned - relations between themselves, click YES. If you wish to set up the models manually, click NO.

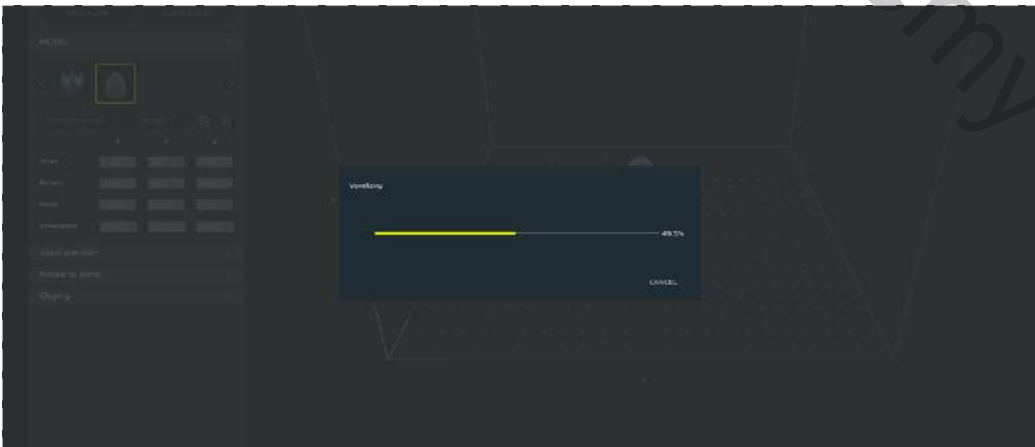
# 3D printing workflow



To the left you will find a toolbar that allows various operations on the models. The options allow for scaling (SCALE), scaling to specific dimensions (DIMENSION), rotating (ROTATE), and moving the model to specific position (MOVE). Remember that if the models are aligned, you should edit them together.

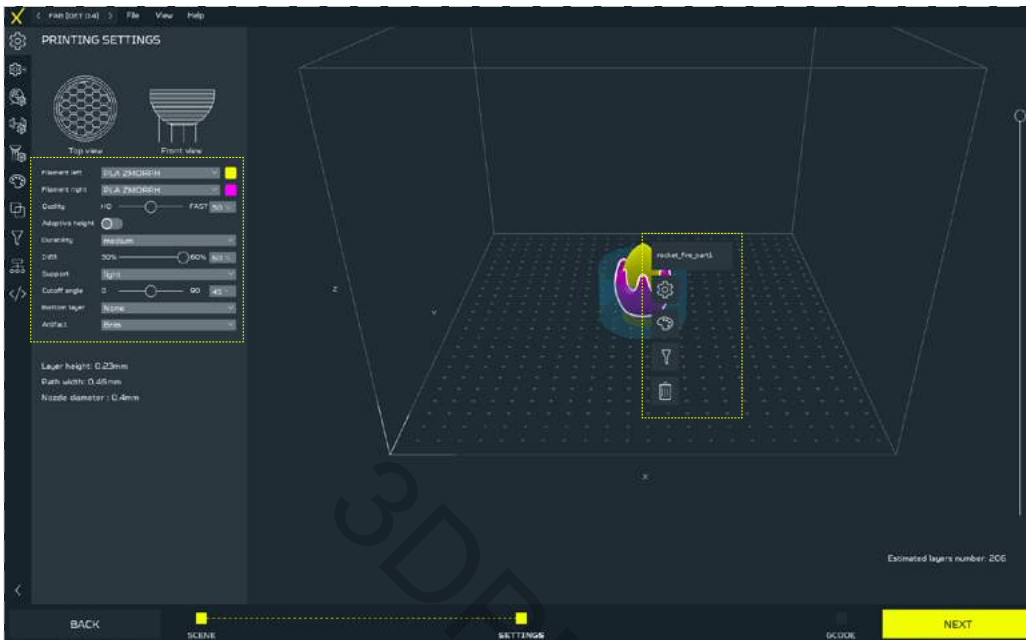


You can set values manually or use sliders.



Set the model according to your preferences and click NEXT to voxelize the model.

# 3D printing workflow



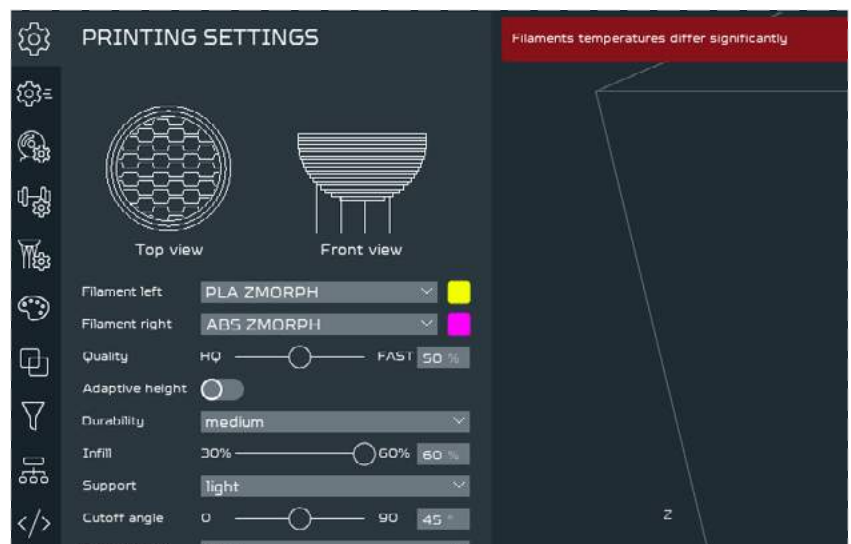
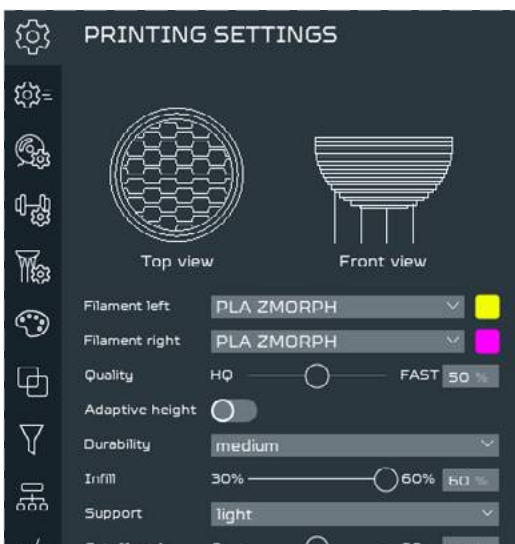
The second step of the file preparation is to set the printing parameters. There are 2 types of menus - global (placed to the left of the screen) and local (opened by clicking the right mouse button on the model).

## NOTE

There can be many different unbound models on the workspace, by clicking the right mouse button on them different printing parameters can be selected for each of them.

In the global menu you can set:

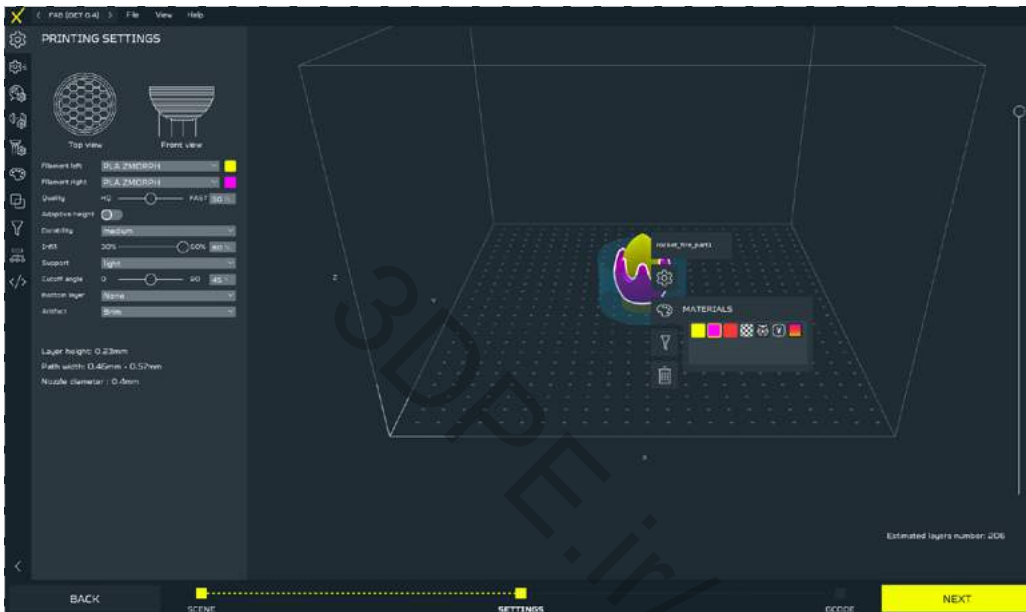
**Filament Left and Right** - choose your filament, e.g.: PLA ZMorph, ABS ZMorph, PET ZMorph. The filament icon opens the preset library. If you choose a pair of filaments that have different printing temperatures, a warning message will appear.



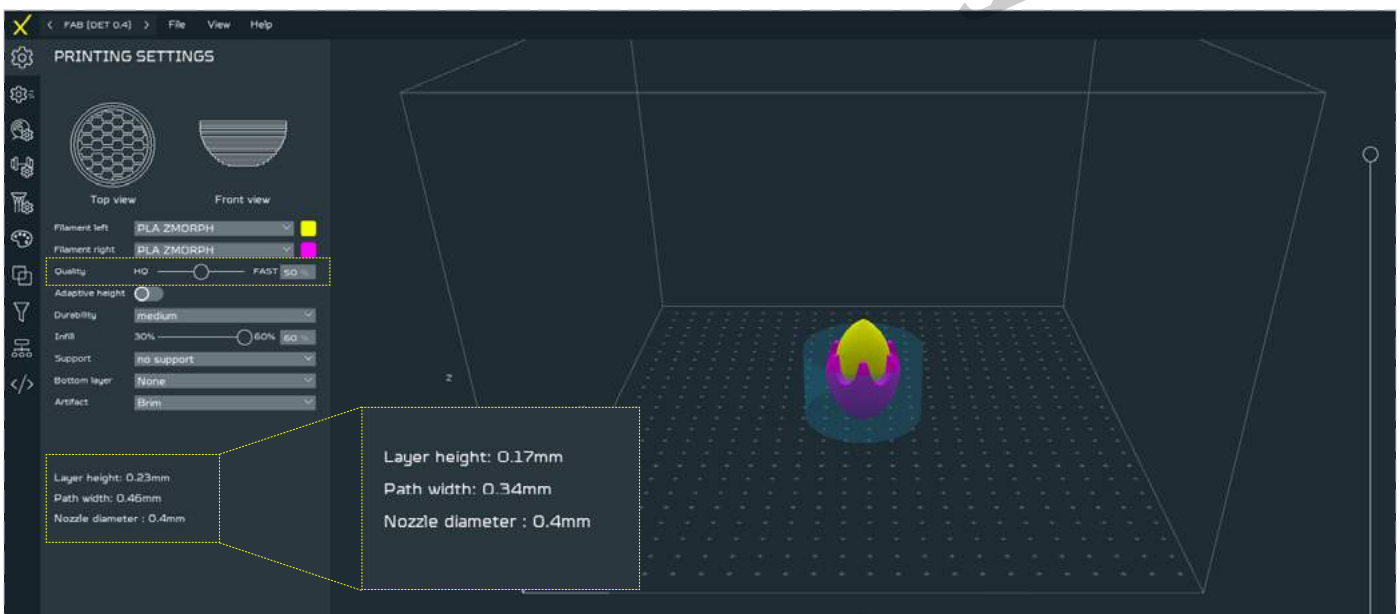


# 3D printing workflow

The software will separate the imported models allowing to set individual parameters for both of them. To assign filaments (left/right) to the models, right mouse click on a chosen model, go to Materials menu, and choose pink or blue color. The colors have their counterparts in main menu toolbar. After defining two different materials, the software will create an artifact that clears the nozzle from the filament.

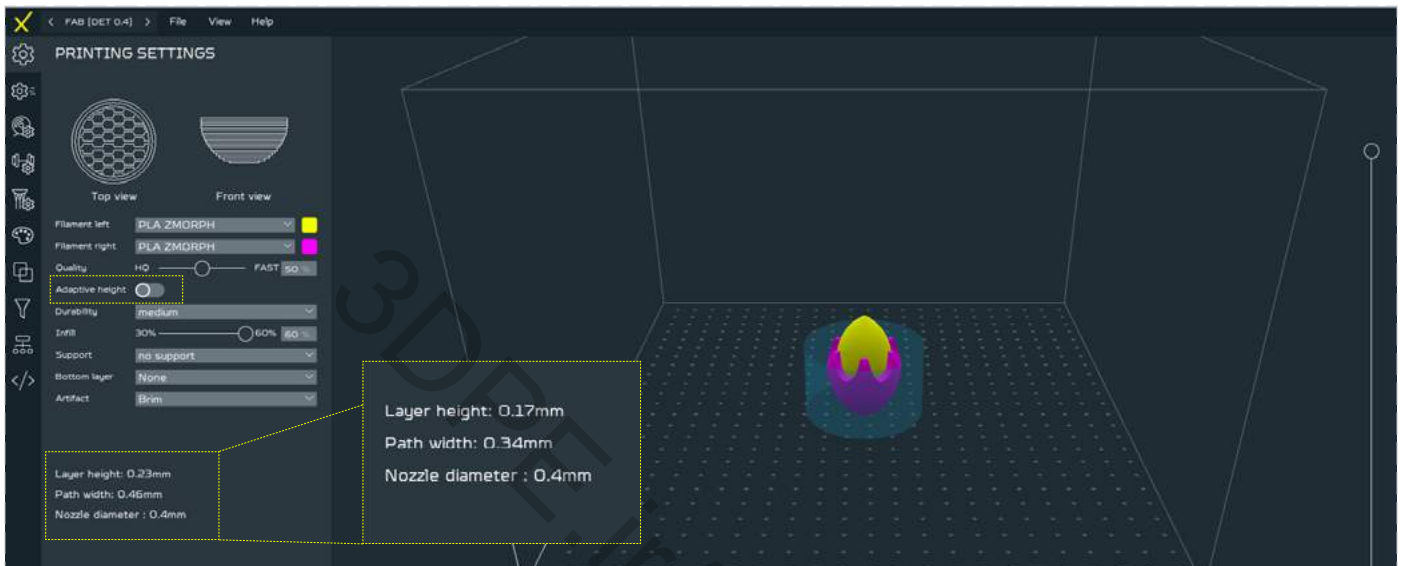


**Quality** - is a simplified option to select model quality settings, allowing you to select the layer height and path width with a single slider. HQ guarantees the highest quality, at the expense of the print speed (lasts longer), while FAST guarantees a faster printout, at the expense of a larger layer, and thus lower quality. Recommended settings of 50% guarantee the best quality to print speed ratio. The current path values and layer height are shown under the basic menu. Quality can also be defined separately for different models, editing takes place in the local menu.

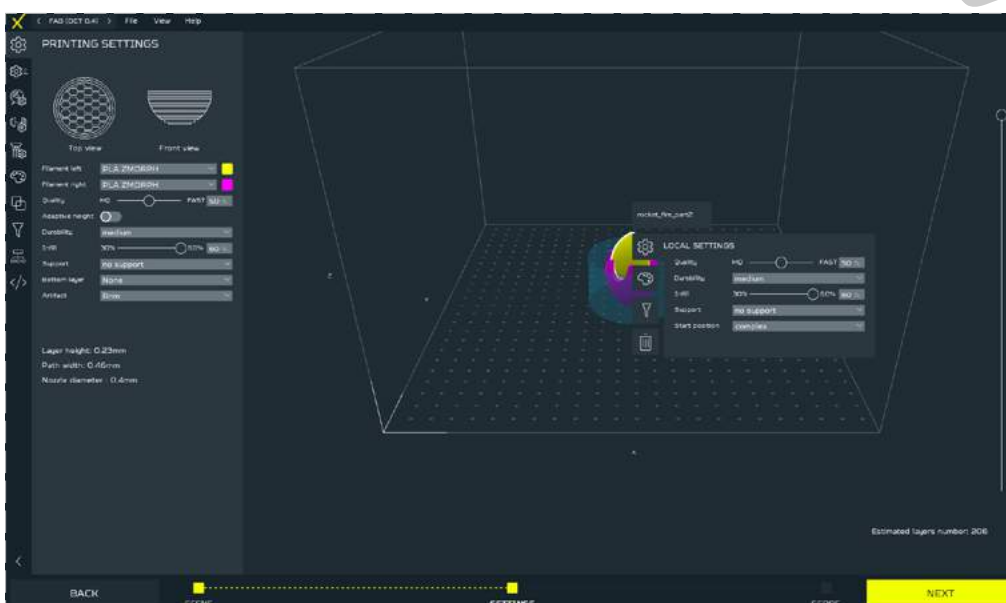


# 3D printing workflow

**Adaptive height** - option to enable or disable the height of the Adaptive Layer. This function allows the program to adjust the height of the print layer depending on the geometry of the model. The path width and default layer height values change to ranges that can be modified again using the Quality slider.

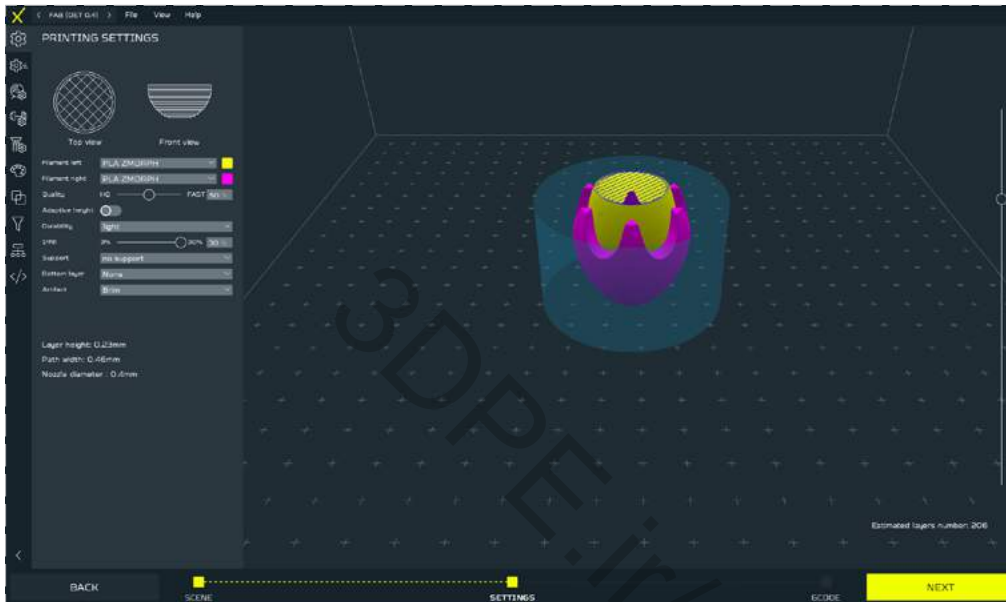


**Durability** - model durability settings. The function takes into the account the number of the model walls and the range and type of infill. There are 5 types distinguished, which are described in the part concerning Singles 1.75 above. Durability in the main menu imposes settings for both models. If you want to have different models in both models, use the local menu, right-click on the model you want to edit and change its settings in Local Settings.



# 3D printing workflow

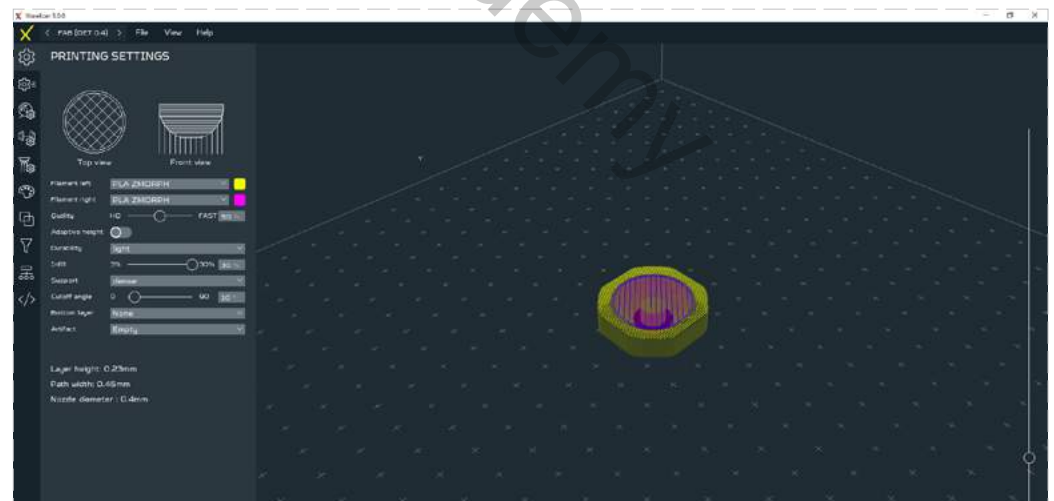
**Infill** - selection of model infill value within the range defined by Durability. The setting can be edited using the slider or entered manually. Generating a preview of the infill is performed on an ongoing basis, which allows for a quick assessment of the selected type and size of infill.



**Support** - enable/disable the support structure.

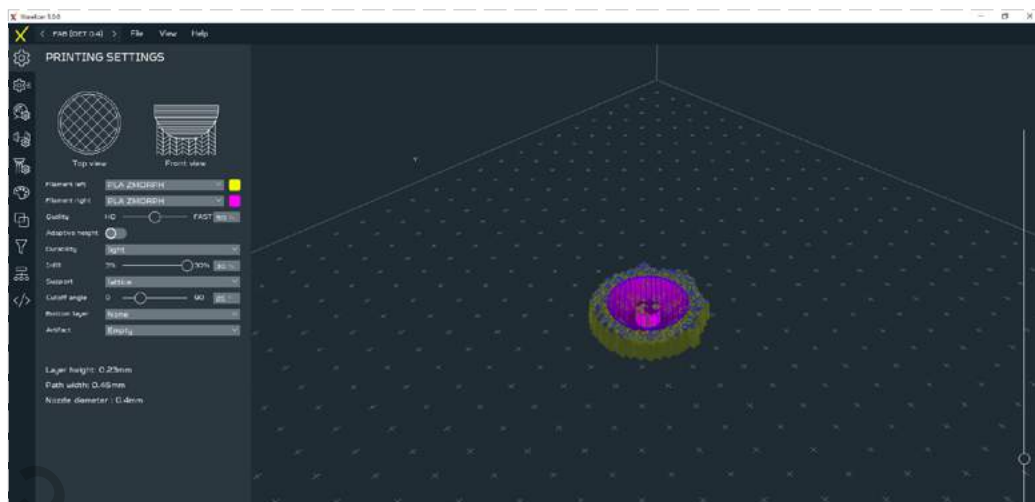
**There are 6 types of support:**

- Dense

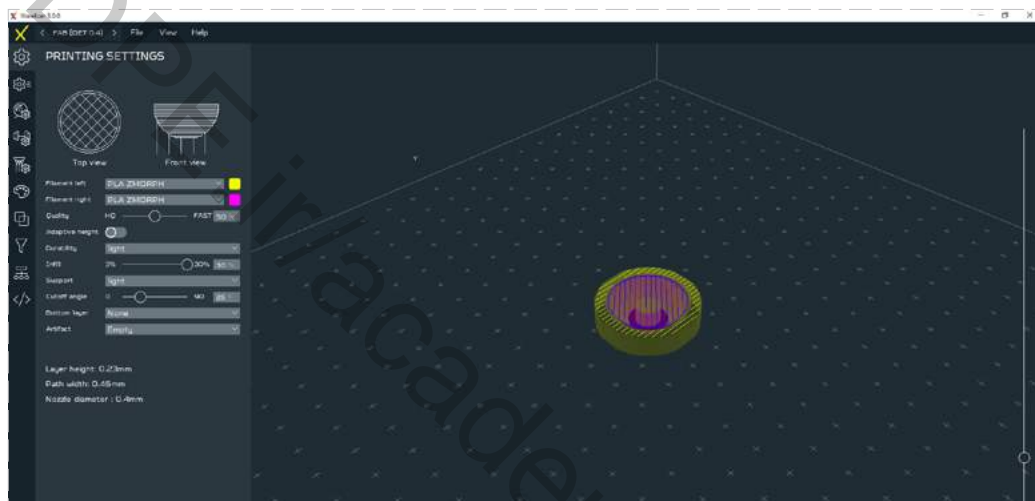


# 3D printing workflow

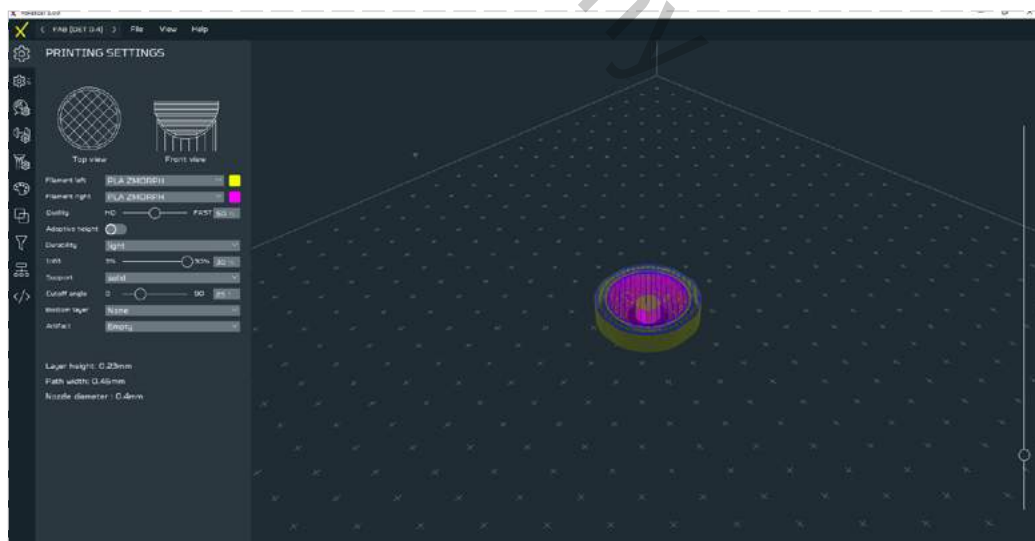
## ■ Lattice



## ■ Light

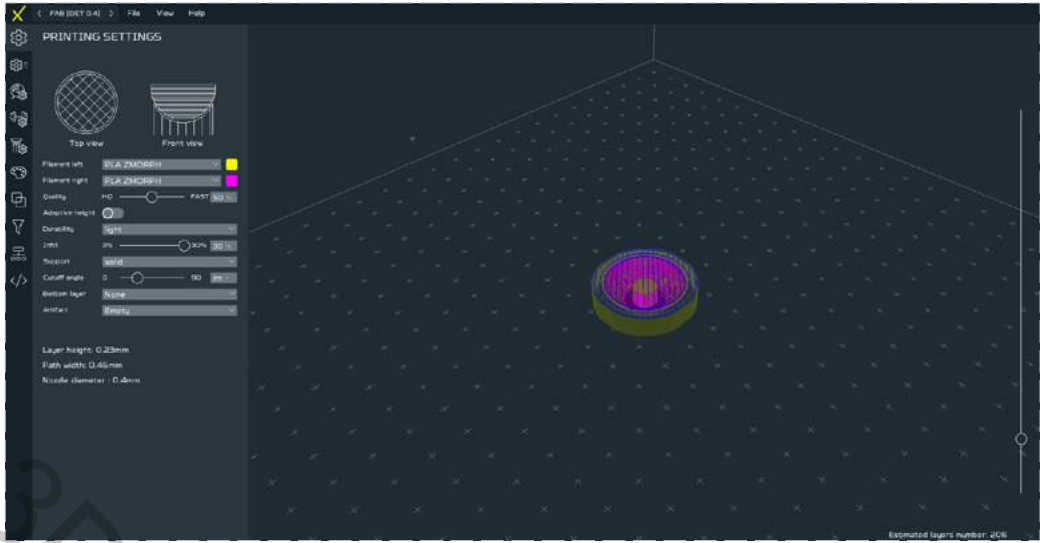


## ■ Solid

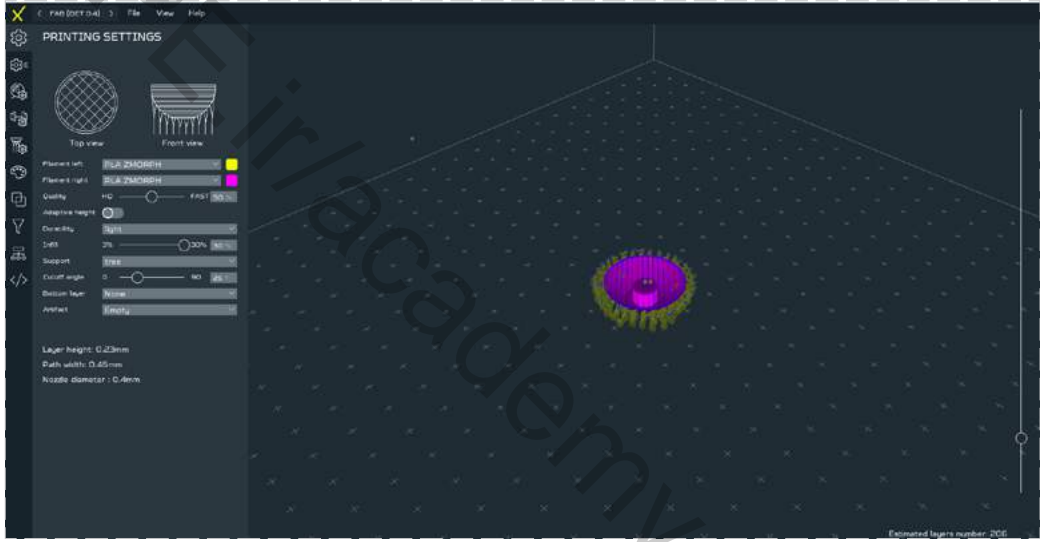


# 3D printing workflow

- Solid PVA - support dedicated for Dual Extruder Toolhead.

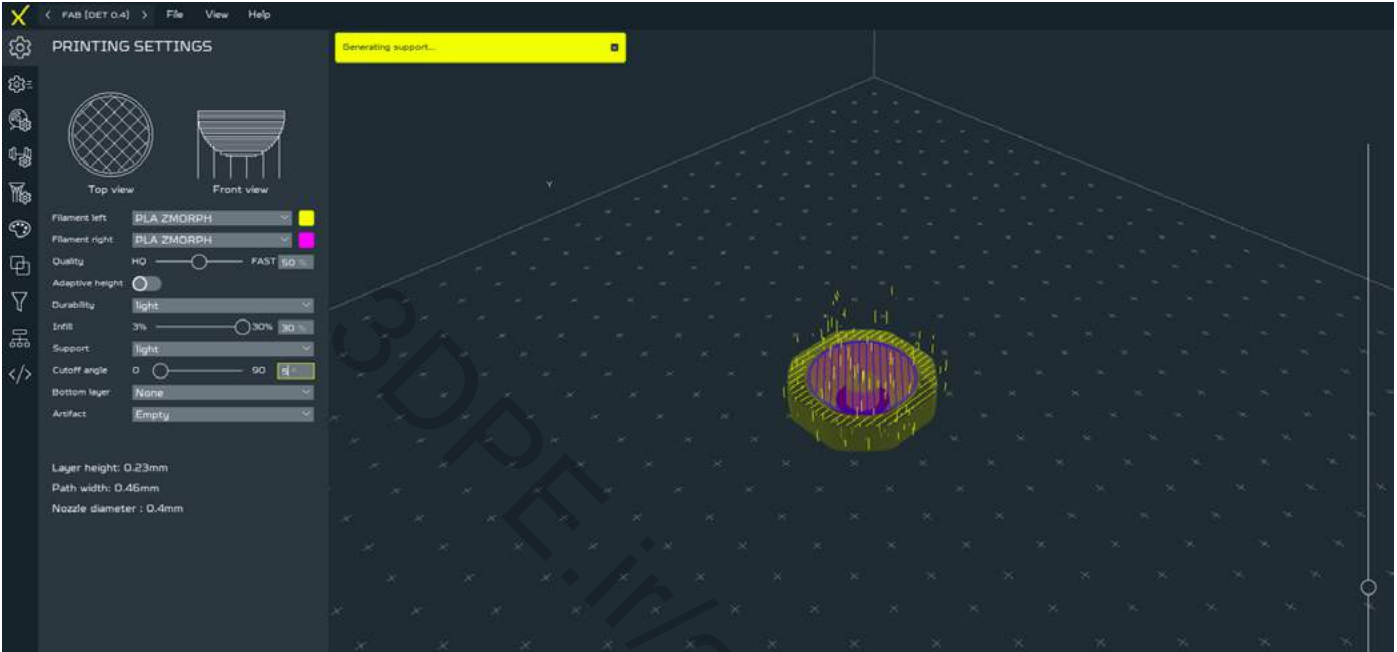


- Tree

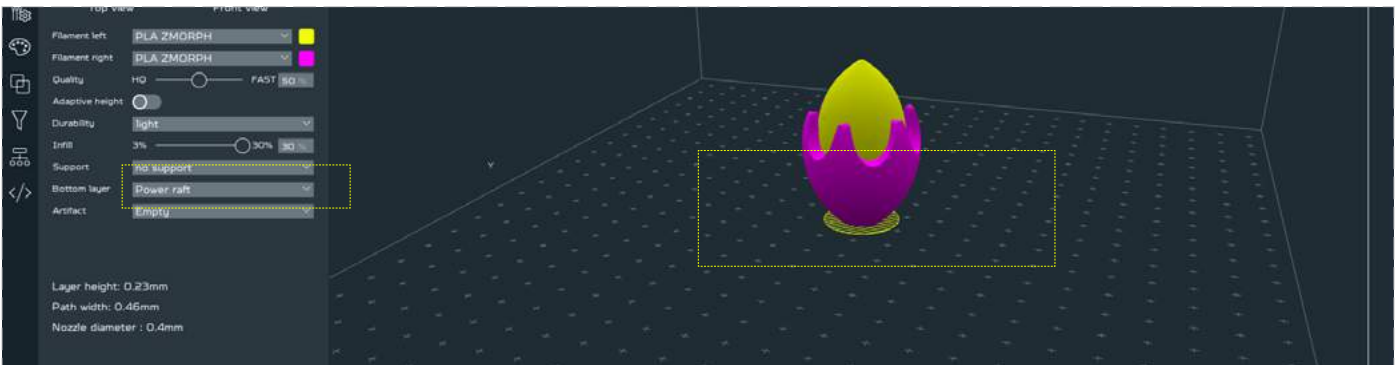
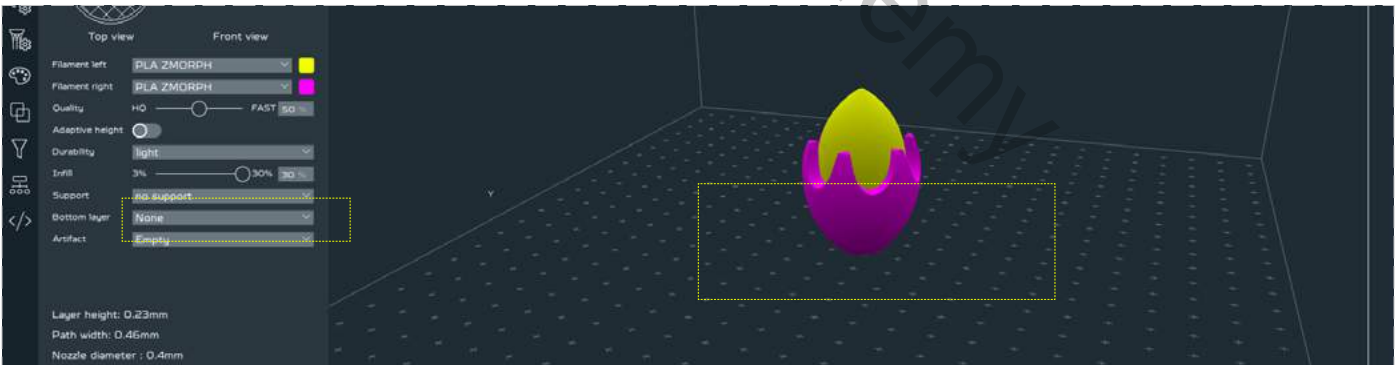


# 3D printing workflow

After selecting any of the support, a window appears to define the angle of inclination of the wall under which the support should be generated. This is the minimum angle value for the creation of support structures. Slide left for more support, right for less support.



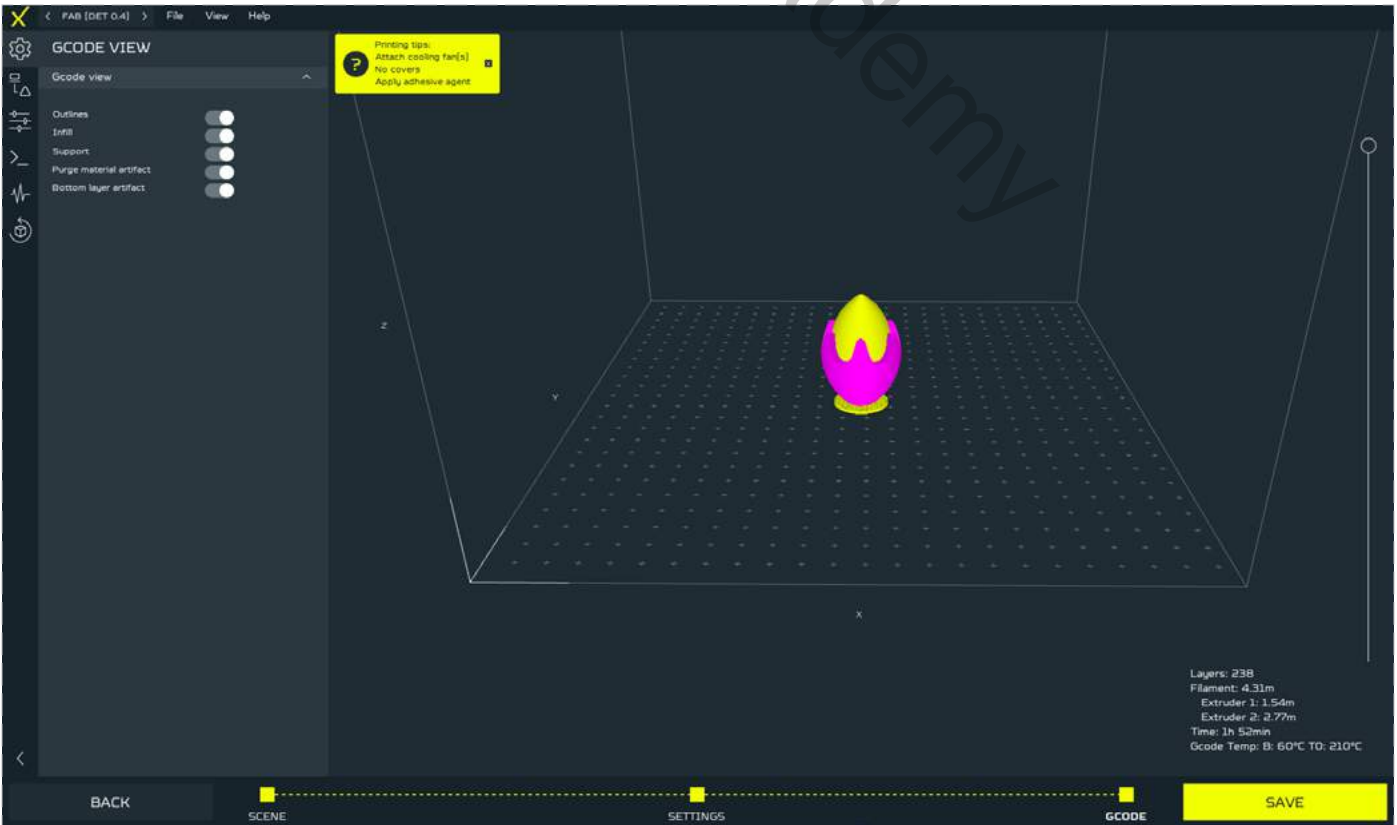
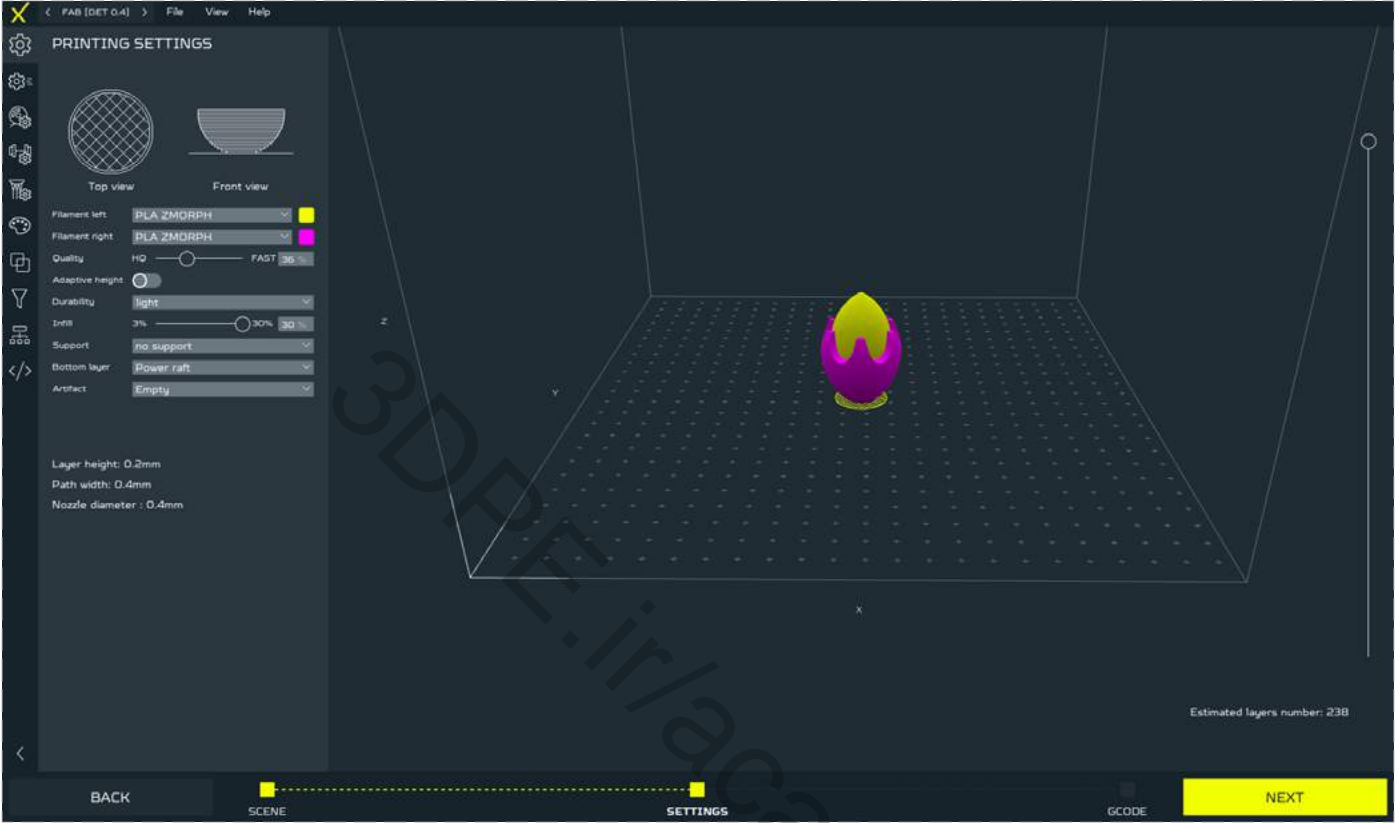
**Power raft** - an option used to enable/disable power raft, i.e. a platform that increases the adhesion of the printout to the work table.





# 3D printing workflow

After all the parameters are set, click NEXT. The model is subjected to slicing and as a result .gcode file is generated. To save it, use the SAVE button.

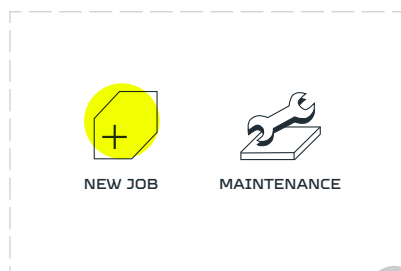




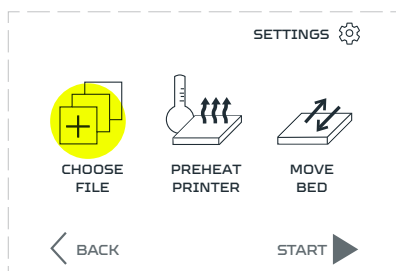
# 3D printing workflow

## 12.12 Starting the print

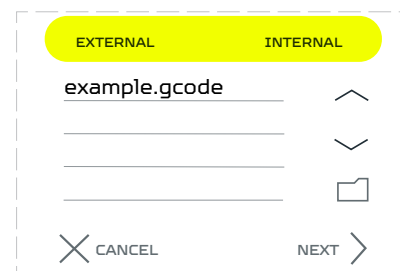
After uploading the file to an internal card or inserting an SD card with the file: Choose 'New Job'



Choose 'NEW JOB'.



Choose 'CHOOSE FILE'.



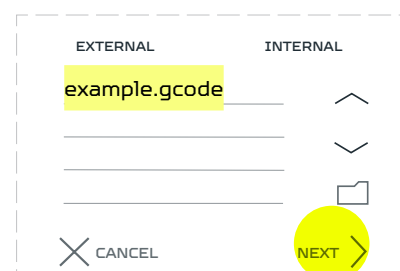
Files uploaded to the internal card are located in the 'INTERNAL' tab, files uploaded to the SD card are located in the 'EXTERNAL' tab.



Select the previously prepared G-code file. To open a folder, select its name.



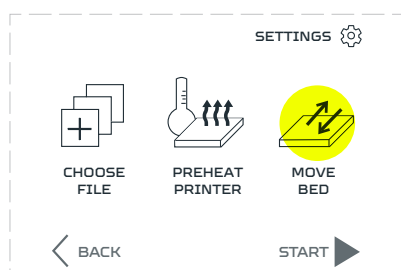
Exiting the folder is done by selecting the folder icon.



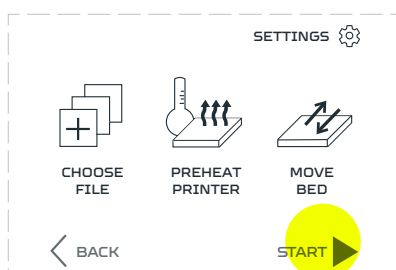
After selecting the file choose 'NEXT'.

### NOTE

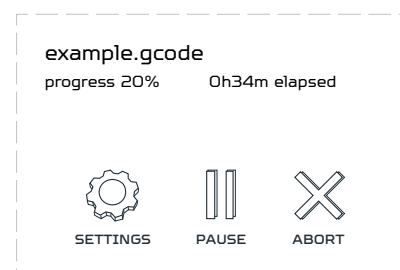
If the selected G-code file has temperature presets after pressing the 'NEXT' button the machine will automatically start preheating.



The table can be prepared by selecting 'MOVE BED' and is described in the chapter 'Preparing the worktable'.



Choose 'START'.

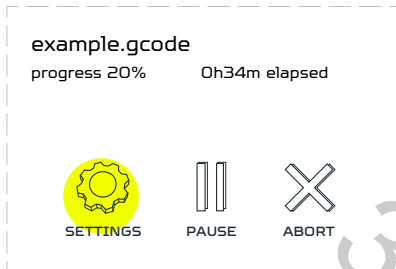


Printing will start automatically when the extruder and the table have reached the right temperature.

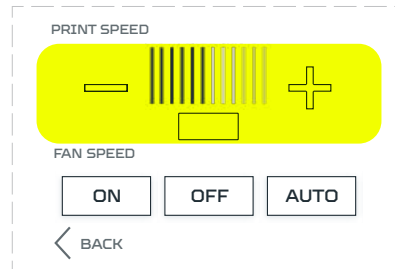
# 3D printing workflow

## 12.13 Editing parameters during printing

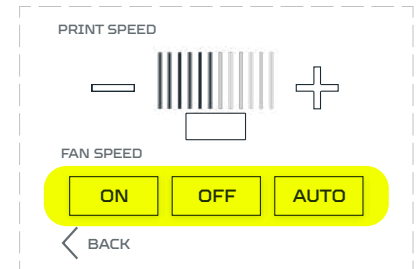
Functions allowing to change parameters during the printing process:



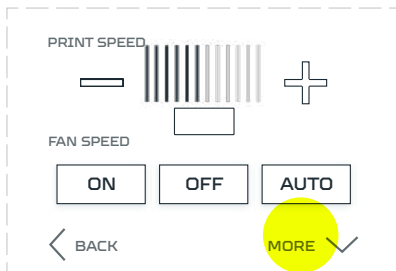
Choose 'SETTINGS':



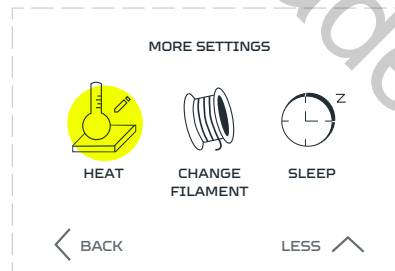
The 'Print Speed' part allows you to change the print speed. Select the plus sign to increase or the minus sign to decrease the speed from 5% to 300% of the initial speed.



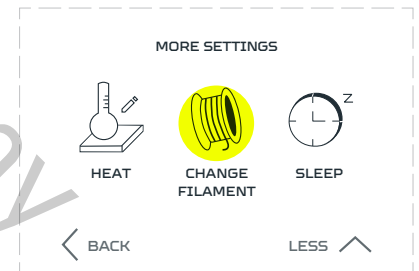
The 'Fan Speed' section allows you to change the settings of the fan, the 'ON' option turns on the fan at 100% and the 'OFF' function turns off the fan. After selecting the 'AUTO' option, the speed of the fan is set according to the G-code.



Choose 'MORE':

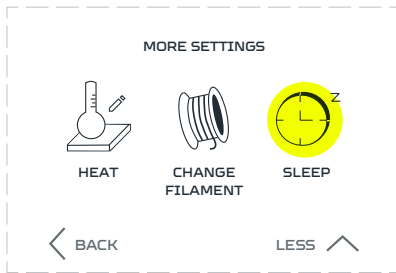


The Heat function allows you to change the temperature of the extruder and the table. Choose 'HEAT' and tap the needed temperature on keyboard, then OK.

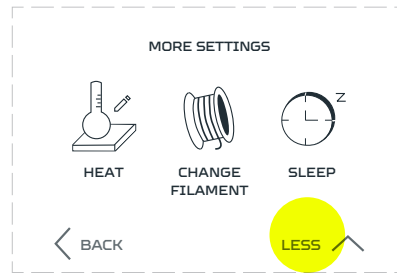


The 'CHANGE FILAMENT' function allows you to change the filament during the printout and is described in the chapter 'Filament replacement during printing'.

# 3D printing workflow



The 'SLEEP' function allows you to put the printer into hibernation mode and is described in the [12.18 chapter](#).

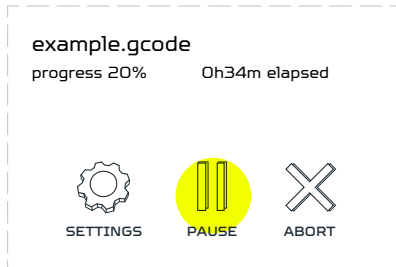


To return to the previous screen, select 'LESS' or return to the main printing screen by pressing the 'BACK' button.

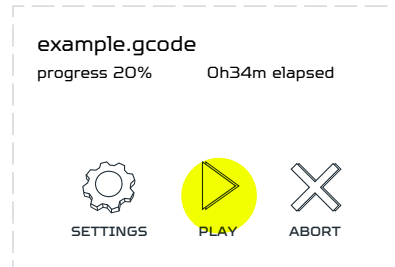
3DPE.ir/academy

# 3D printing workflow

## 12.14 Pause and resume printing



While the machine is running, press the 'PAUSE' button on the screen to stop printing.



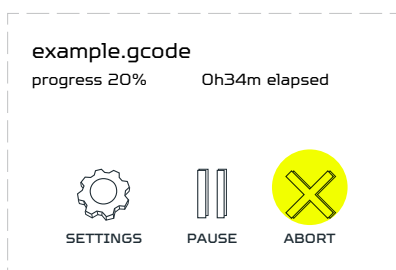
Choose 'PLAY' to continue printing. The printer will resume the printout exactly where it was stopped.

### NOTE

If the Pause was long, the heat from the nozzle might have melted a small portion of the printed model or the spilling material from the nozzle may have settled at the nozzle stopping place.

Pause mode has no time limit. During its duration, the extruder maintains the same temperature all the time, which causes the additional material to flow out of the nozzle.

## 12.15 Abort Printing



To stop the print choose 'ABORT'



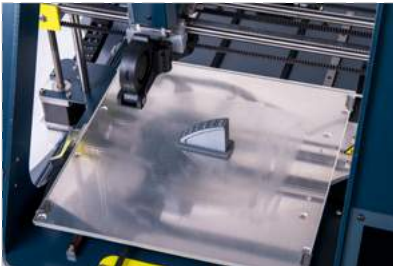
The printer will ask you to confirm that you want to abort the printing process. To do so, choose 'OK'.



If you do not want to abort the printing choose 'BACK'.

# 3D printing workflow

## 12.16 Removing a printout from the platform



Wait until the temperature of the table drops before removing the printout from the table. This will allow you to remove the printouts without damaging them.



If the printout could not be removed despite the low temperature of the table, gently lift the printout with a spatula.

### NOTE

The spatula has sharp edges that may cause the table to be scratched. When taking off the printout, lay it as parallel as possible to the table and be careful.

## 12.17 Support material removal



To be able to print models with more complex geometry, additional support is printed, which is not a part of the model. When the printout is complete, remove them carefully. Pliers are best suited for this purpose. In case of problems with removing the support, you can use a knife to help you.

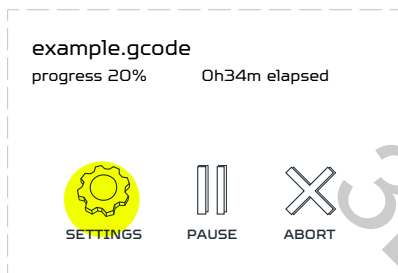
### NOTE

Use safety goggles when removing the support material, small pieces may suddenly brake and scratch your eyes.

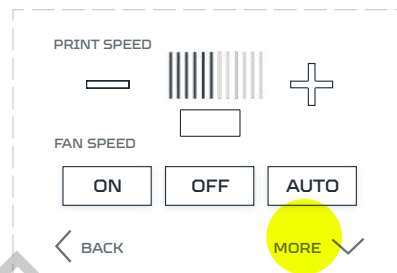
# 3D printing workflow

## 12.18 Hibernation

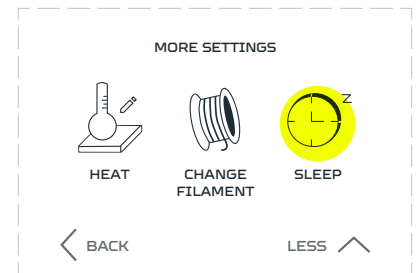
This option allows you to safely pause printing, with the option to resume it if you need to disconnect the printer from the power supply. Hibernation should not be used to pause printer operation for a long time due to the cooling of the table and extruder.



Choose 'SETTINGS'.



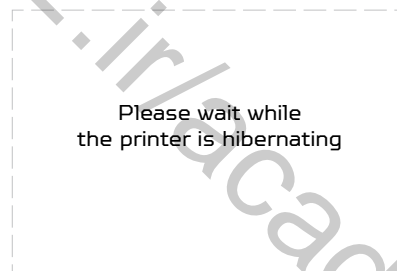
Choose 'MORE'.



Choose 'SLEEP'.



The printer will ask you to confirm your decision. To do this, choose 'YES'. If you do not want the printer to go into hibernate mode choose 'NO'.



Wait for the extruder to finish printing and stop at the right place.



The printer is ready to disconnect the power supply safely when prompted.



Switch the printer on to resume operation.



The printer will ask you to confirm that you want to continue the stopped printout. To do so, choose 'YES'. If you do not want to continue printing choose 'NO'.

### NOTE

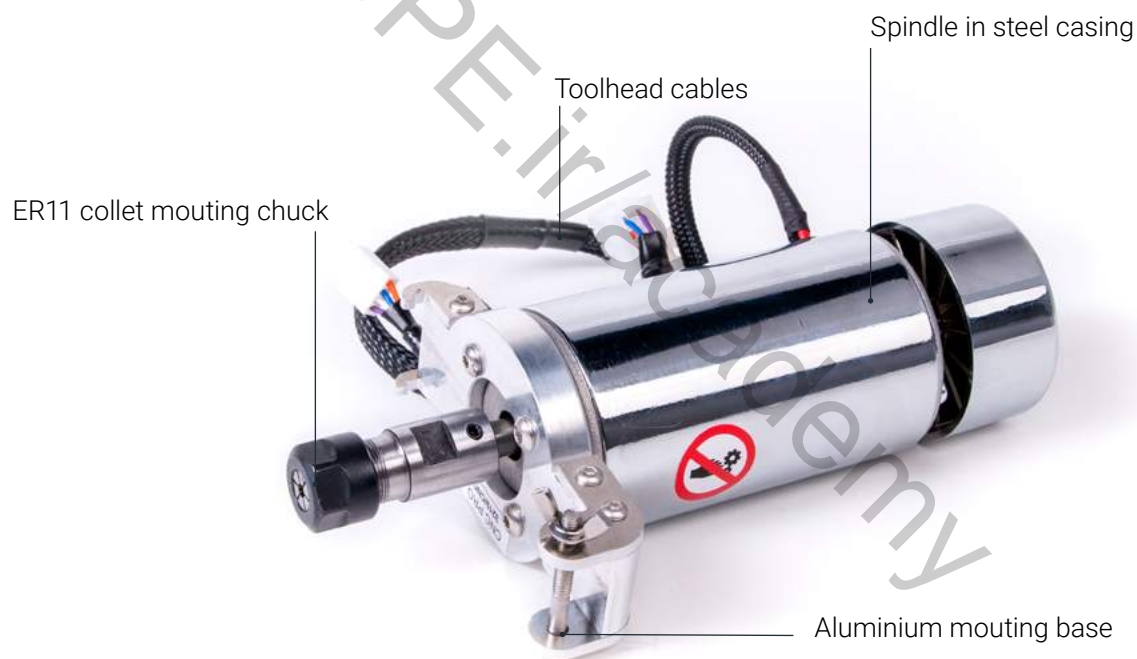
Once the extruder and the table have reached the correct temperature, the printout will start automatically from where it was stopped.

## 13. CNC milling workflow

### 13.1 CNC Milling Toolhead

CNC Milling Toolhead is a toolhead used in milling and engraving operations. It consists of 300W spindle, in a steel casing, and aluminum mounting that allows for attachment of the toolhead to X-carriage of Zmorph Fab machine. Provided with ER11 collet. It can be exchanged to use up to 7 mm diameter shank cutters.

Main elements of CNC Milling Toolhead toolhead:



#### Specification:

- Construction: Stainless steel housing
- Collet: ER-11
- Spindle motor: DC motor
- Power: 300 W
- Default work speed: 5 mm/s
- Max work speed: 120 mm/s
- Work area: up to 235 x 250 x 85 mm
- Recommended cutting depth: 0.5 mm for soft wood and polymers
- Max cutting depth: 15 mm for  $\varnothing$  3 mm bit
- Dimensions: 90 x 55 x 175 mm



# CNC milling workflow

---

## 13.2 Materials compatible with CNC Milling Toolhead

CNC Milling Toolhead allows milling in soft materials.

The list of tested materials is as follows:

- Wood derivatives: wood, plywood, wood fiber boards.
- Plastics: ABS, nylon, HDPE, PTFE, PC, PP, POM, PMMA, PVC, HIPS, LDPE, PET.
- Composites: carbon fiber laminate, copper clad laminate FR4, Dibond, TCF.
- Metals: aluminum, brass, copper.
- Others: cardboard, machining wax, modelling board, styrodur.

To explore all materials please follow this link to Zmorph Materials Library:

[bit.ly/ZmorphMaterialsLibrary](https://bit.ly/ZmorphMaterialsLibrary)

## 13.3 Material fixturing

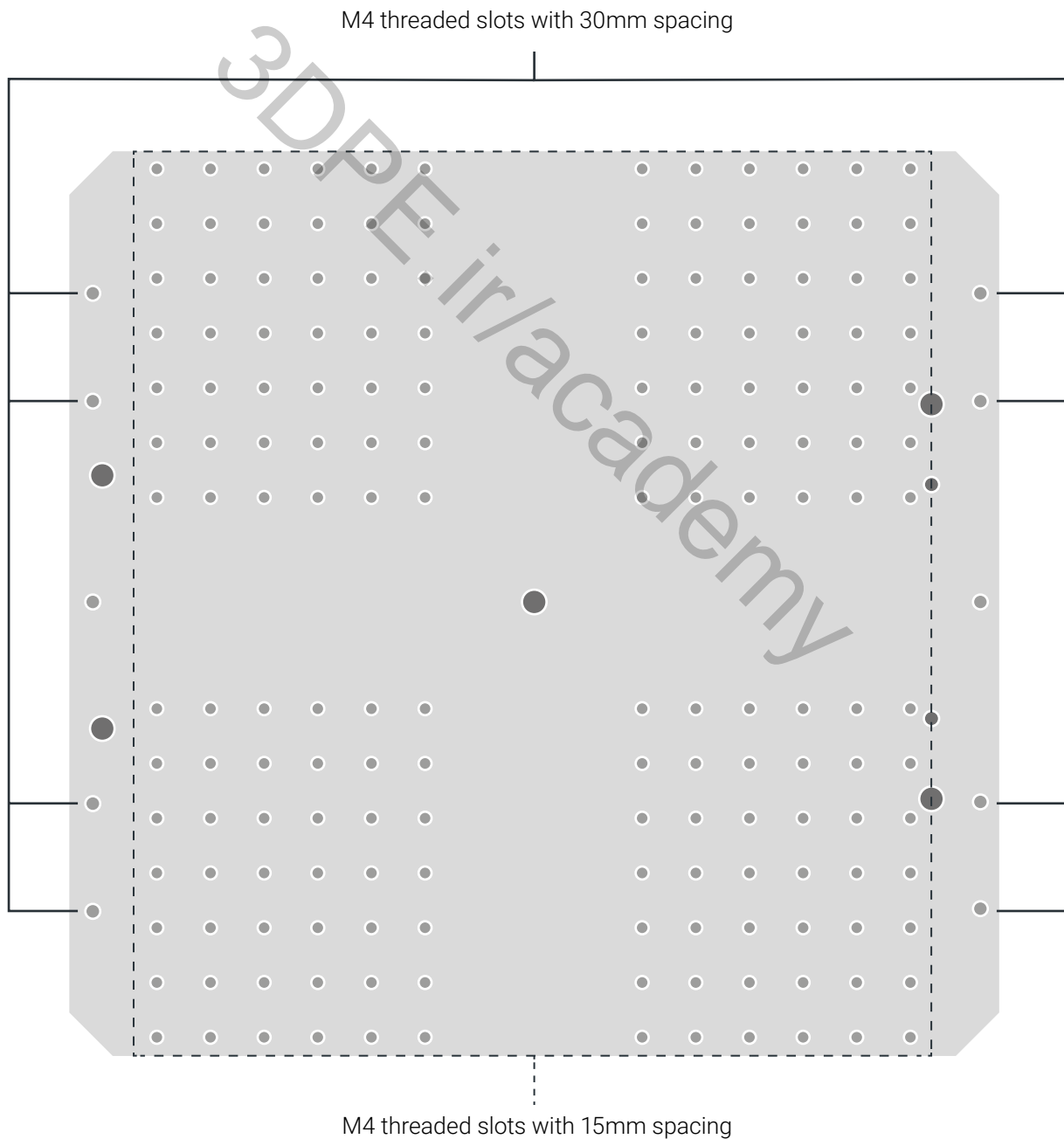


For proper material fixturing during CNC milling operations you need to mount aluminium bed that is added to every Zmorph Fab Full Set or is available in store. To learn how to change your worktable, follow the next parts of the manual.

# CNC milling workflow

## CNC Worktable explained

The CNC worktable has been designed for easy and intuitional material fixturing. Along with the CNC table were designed clamps adapted to the table. Table with dimensions of 259mm x 250mm has M4 168 threaded mounting holes with a spacing of 15mm for materials not covering the entire surface of the table and 8 threaded holes with a spacing of 30mm located on the edges corner enabling fastening of materials taking up the entire working area.



# CNC milling workflow

## Types of workholding solutions

Your workholding solution should be adapted to material and its dimensions to ensure best results. Below you can find most common solutions with pros and cons of every one of them.

Workholding	Usable for	Pros	Cons	Ease of use
Corner Clamp 	<ul style="list-style-type: none"> <li>■ Sheet material.</li> <li>■ Block material.</li> </ul>	<ul style="list-style-type: none"> <li>■ Can be custom 3d printed.</li> </ul>	<ul style="list-style-type: none"> <li>■ Passive, holds the material poorly by itself.</li> </ul>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Side Clamp 	<ul style="list-style-type: none"> <li>■ Sheet material.</li> <li>■ Block material.</li> </ul>	<ul style="list-style-type: none"> <li>■ Can be custom 3d printed.</li> </ul>	<ul style="list-style-type: none"> <li>■ Passive, holds the material poorly by itself.</li> </ul>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Toe Clamp 	<ul style="list-style-type: none"> <li>■ Block material.</li> </ul>	<ul style="list-style-type: none"> <li>■ Can be custom 3d printed.</li> <li>■ Adjustable.</li> </ul>	<ul style="list-style-type: none"> <li>■ Take a lot of workspace.</li> </ul>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Eccentric clamp 	<ul style="list-style-type: none"> <li>■ Sheet material.</li> </ul>	<ul style="list-style-type: none"> <li>■ Can be custom 3d printed.</li> <li>■ Adjustable.</li> </ul>	<ul style="list-style-type: none"> <li>■ Harder to use.</li> <li>■ Only for flat, sheet materials like plywood.</li> <li>■ Take a lot of workspace.</li> </ul>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Top Clamp 	<ul style="list-style-type: none"> <li>■ Sheet material.</li> <li>■ Block material.</li> </ul>	<ul style="list-style-type: none"> <li>■ Can be custom 3d printed.</li> <li>■ Allow for mounting materials of different heights.</li> </ul>	<ul style="list-style-type: none"> <li>■ Stick out above material surface.</li> </ul>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

# CNC milling workflow

## 13.4 Milling cutter fastening

To ensure safe and reliable milling process, you must properly mount your milling cutter. The process is the same regardless of cutter type and geometry.



Remove the CNC Milling Toolhead from your machine.



Take a 13 mm spanner and an adjustable wrench.



Slide the 13-mm spanner into the shown slot.



Adjust the size of wrench to 17 mm and hold down the collet fastening nut. Loosen the nut.



Take out the old cutter if any is inserted.



Put in a new cutter. Ensure that it is inserted at least 15 mm deep.



Firmly tighten the collet nut.



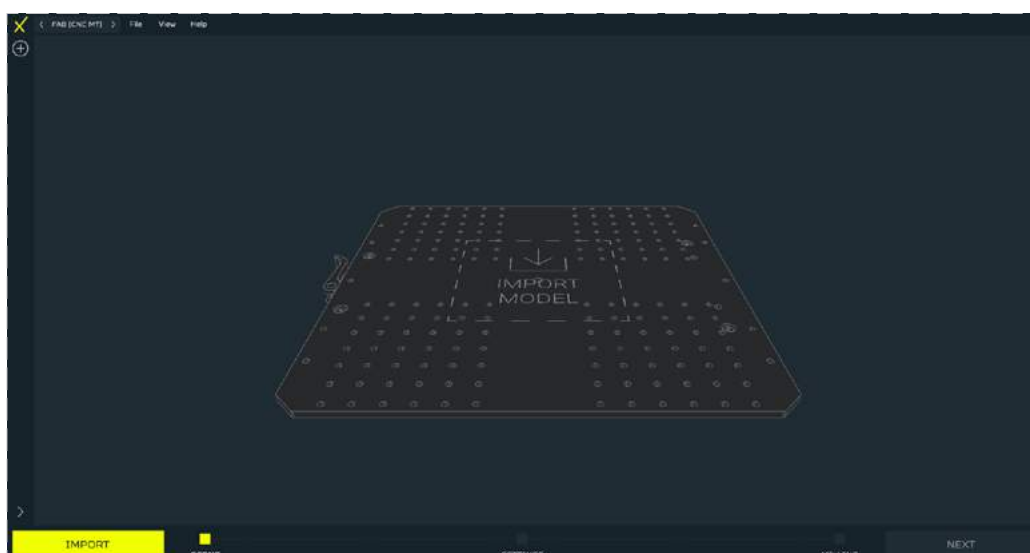
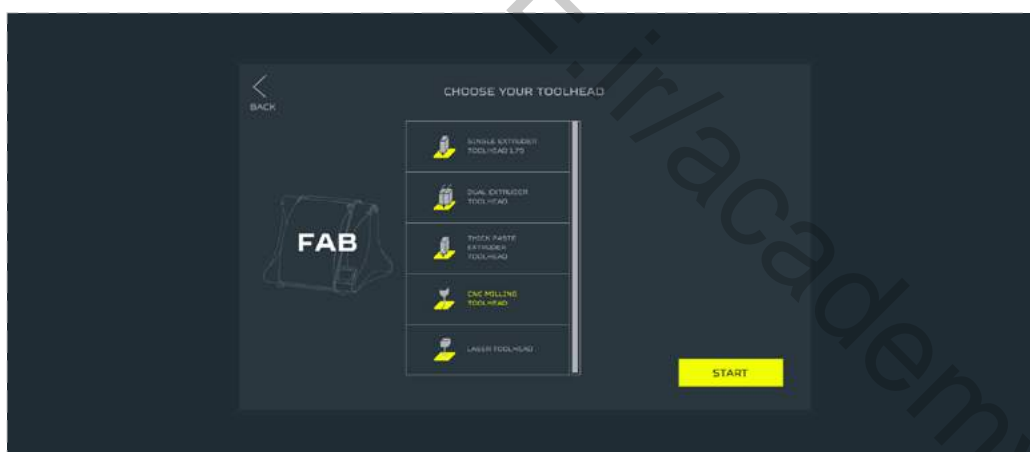
Mount the CNC toolhead on the X-carriage

# CNC milling workflow

## 13.5 CNC milling file preparation



Open Voxelizer 3.0 software and choose Zmorph Fab machine, CNC Milling Toolhead and click the START button.



Import your file by pressing the IMPORT button or the IMPORT MODEL sign on the table.

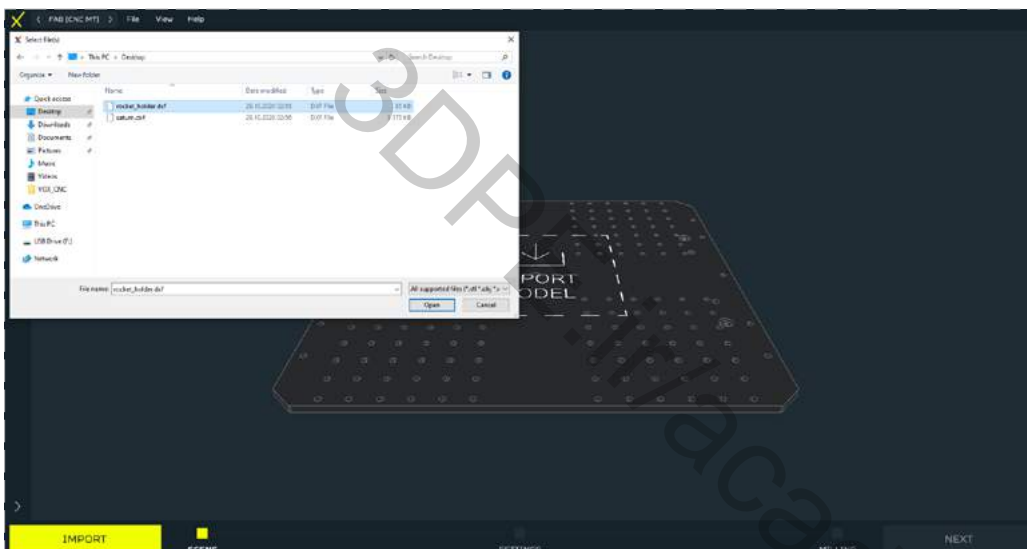
# CNC milling workflow

## NOTE

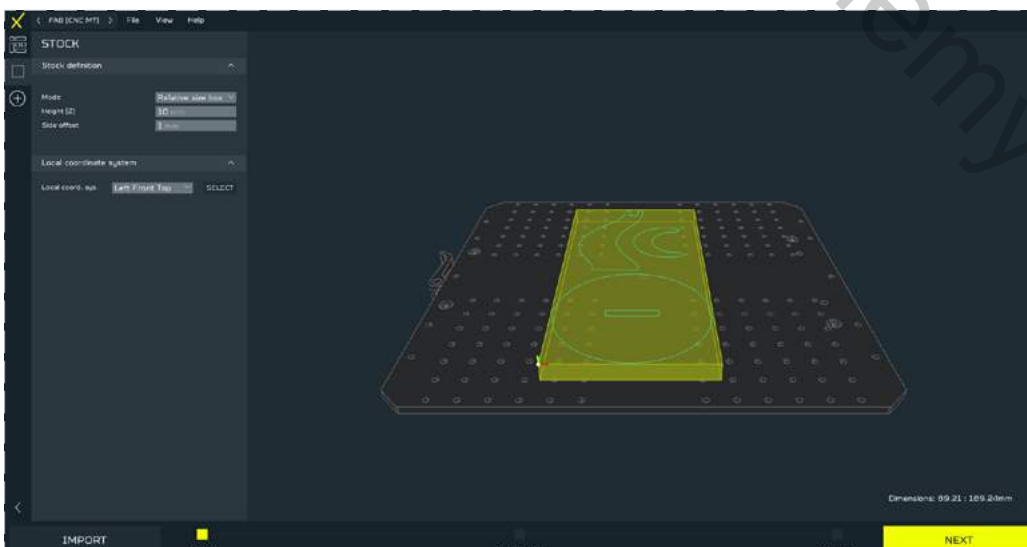
You can also drag & drop the file into the software from your computer.

Depending on the selected file type (2D or 3D), Voxelizer will automatically adapt to further work.

## 2D Milling

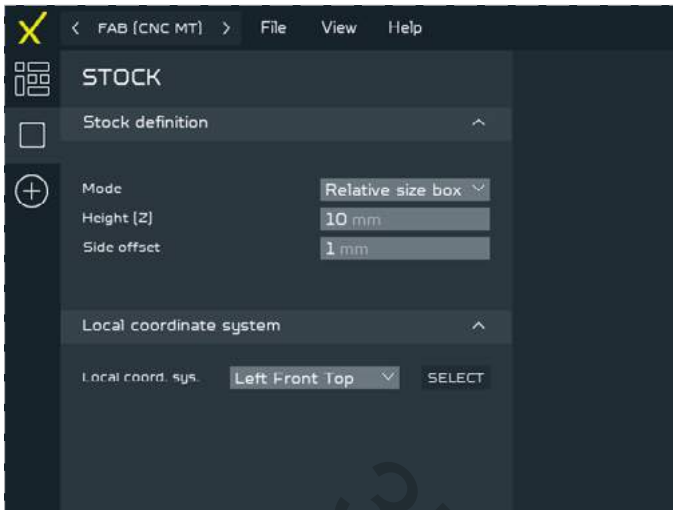


Import a .DXF file type.

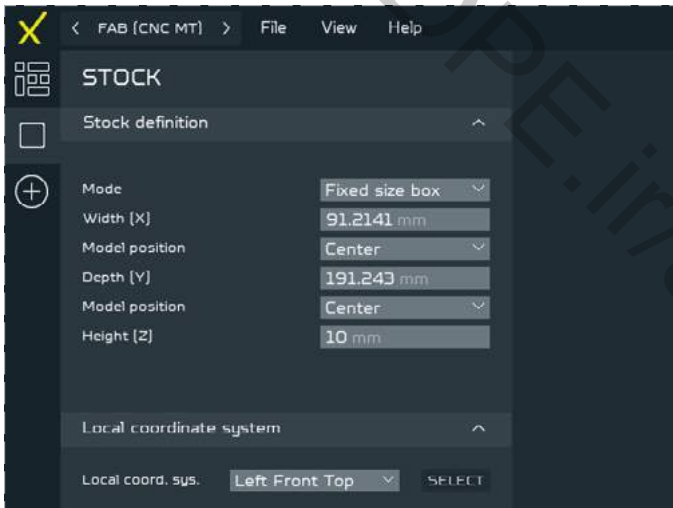


The material dimensions (by default) will automatically adjust to the model dimensions (with a 1mm offset from the edge).

# CNC milling workflow



To set material dimensions manually to match the Raw material that would be used for milling, change the MODE in the STOCK DEFINITION parameters from RELATIVE to FIXED.

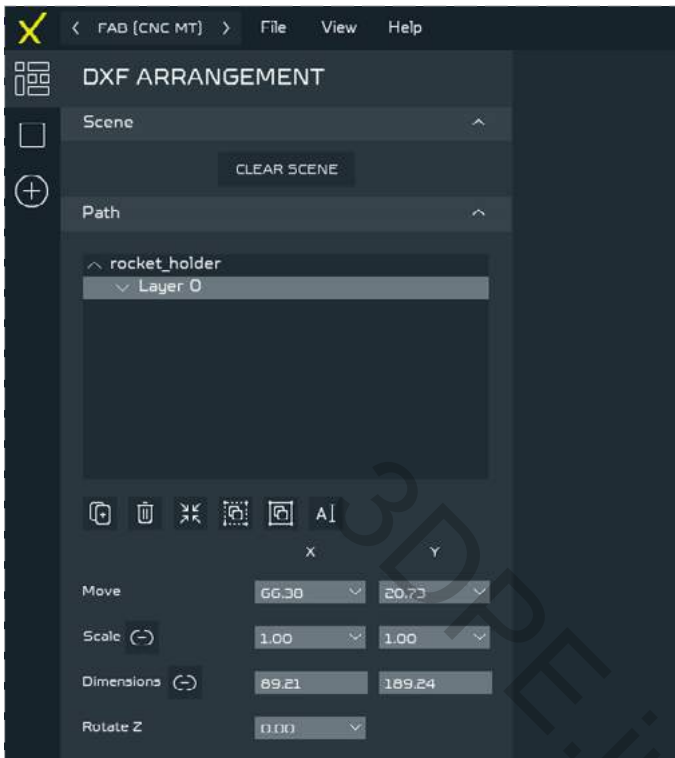


## NOTE

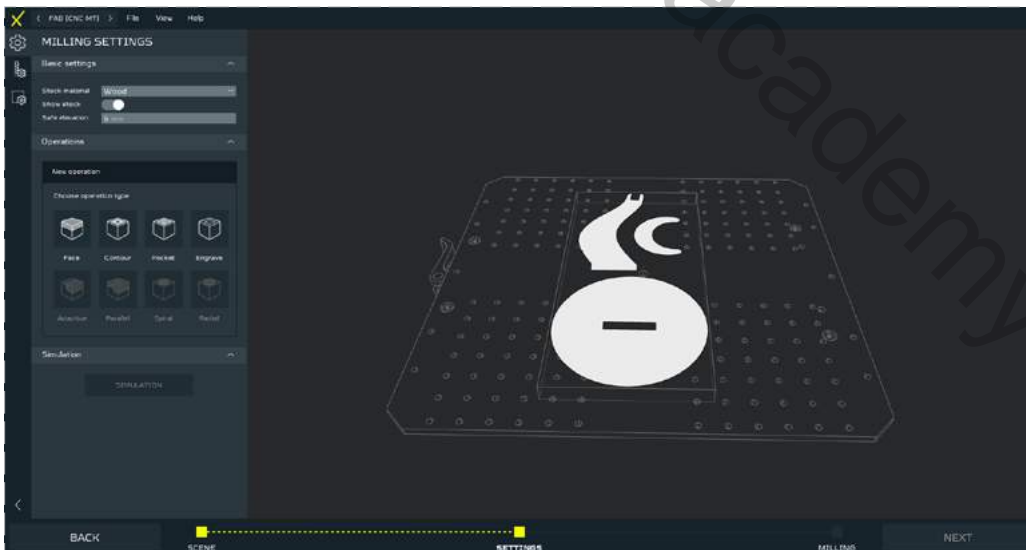
The 'Local coordinate system' is a parameter responsible for setting the local 0,0,0 point in the .Gcode file from which all the spindle operations should be started. It is important to set the same local point in the software as in reality before starting the milling. How to Set the local 0,0,0 point on the machine see [chapter 13.6](#)



# CNC milling workflow

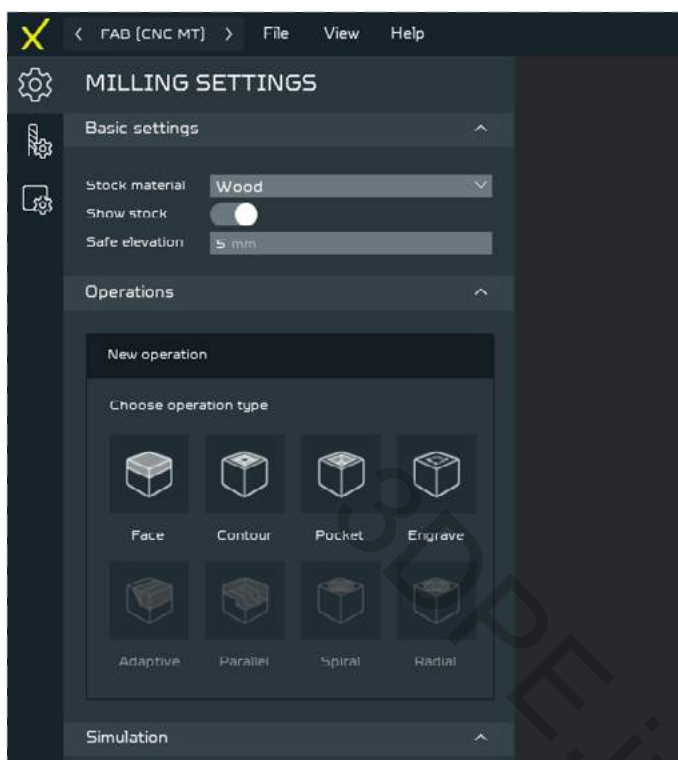


To be able to freely move, scale and rotate the model on the table preview go to DXF ARRANGEMENT menu.



Click NEXT when ready. You will be automatically moved to SETTINGS tab.

# CNC milling workflow

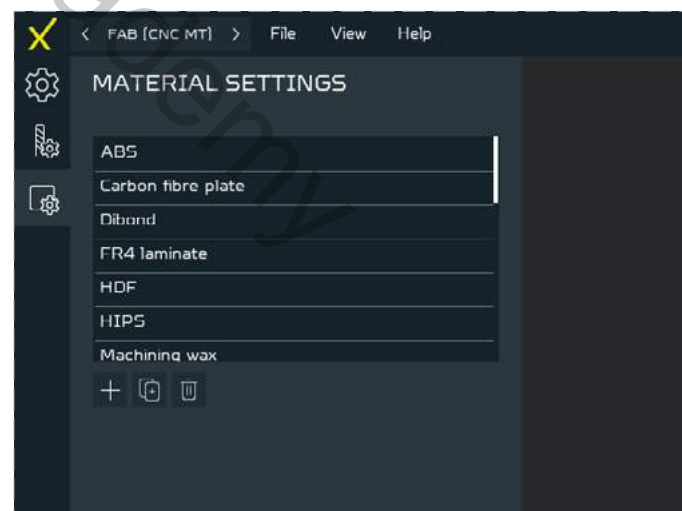
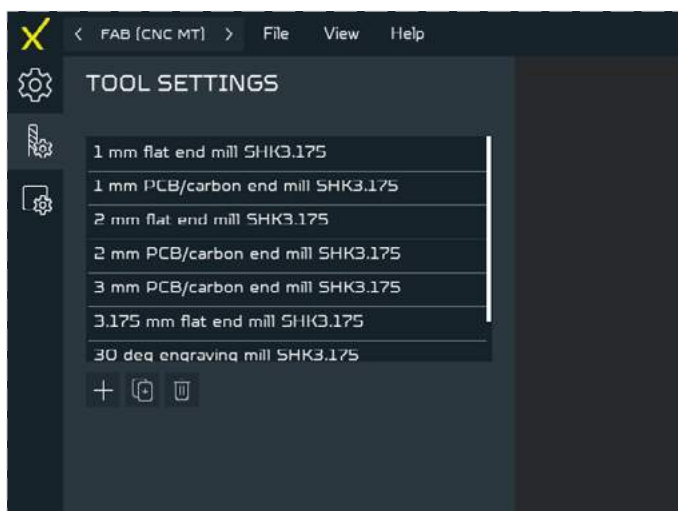


Choose Stock material from the drop down list and set Safe elevation for travel - remember to take into account any fixtures that might stick out over the material surface.

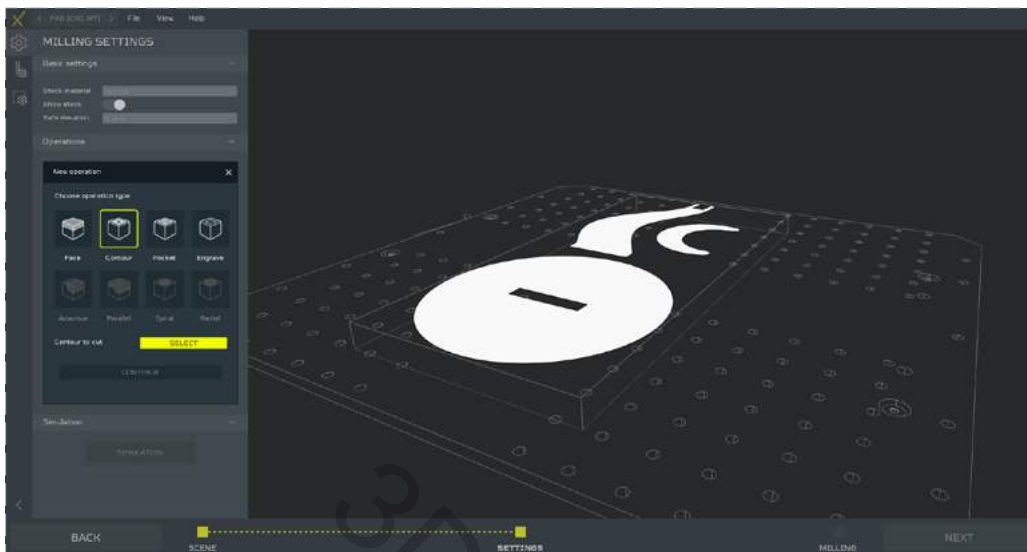
## NOTE

By pressing the SHOW STOCK parameter it will turn ON the material visualization.

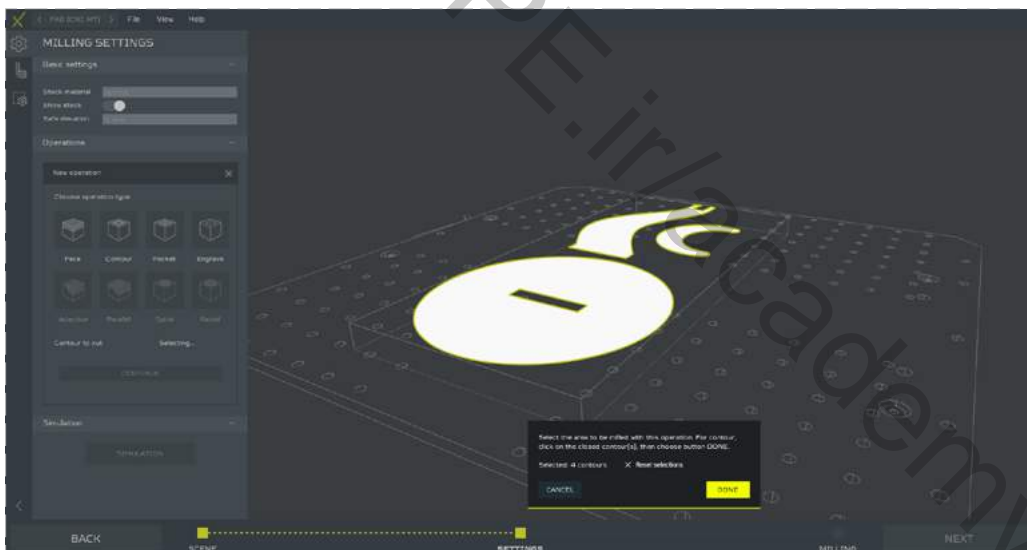
You can define your Cutting Tool and Stock material in the TOOL and MATERIAL SETTINGS menu.



# CNC milling workflow



To start working with the model first choose the operation that you would like to mill with. Next press the SELECT button to choose the Contour to cut with the operation.

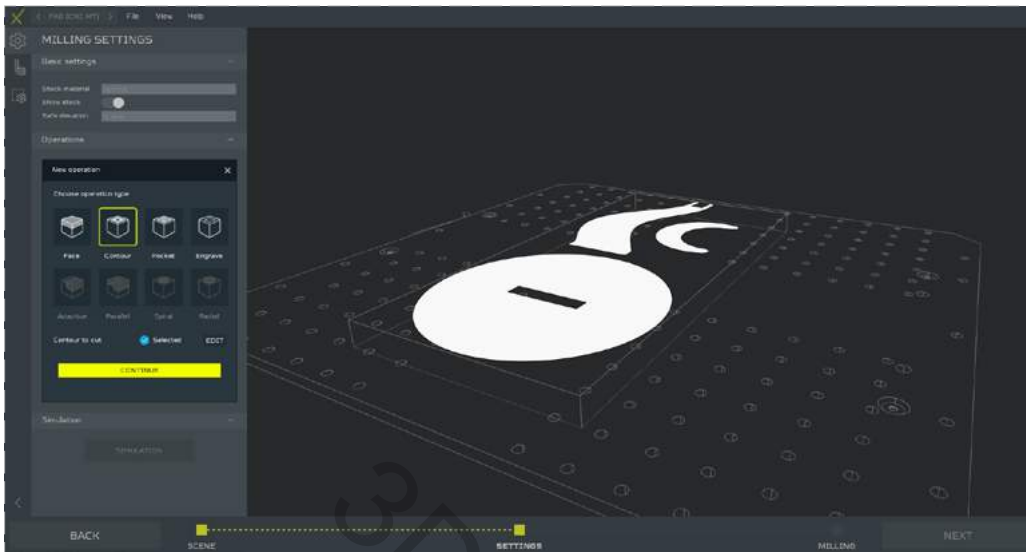


When finished press the DONE button.

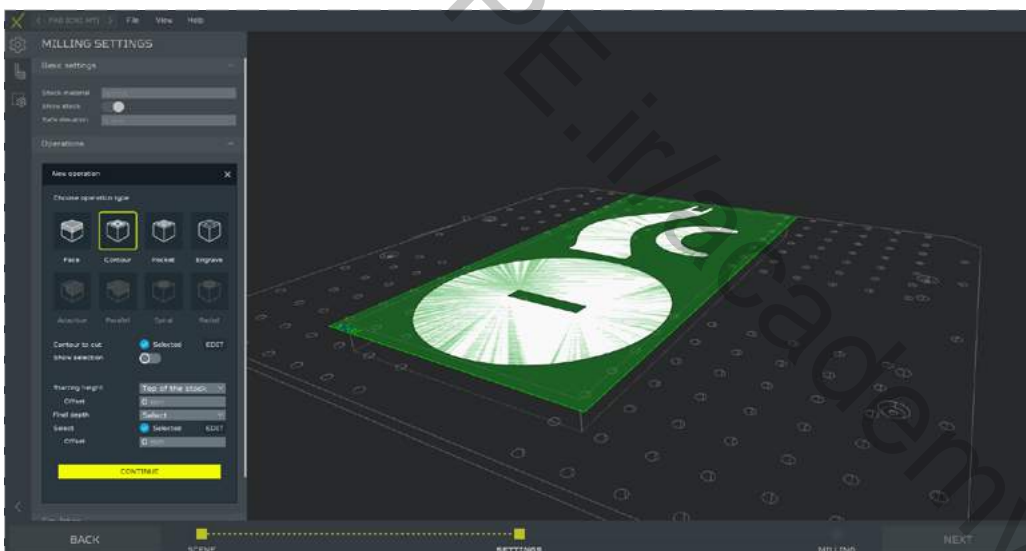
## NOTE

It is possible to select multiple contours at once for one operation.

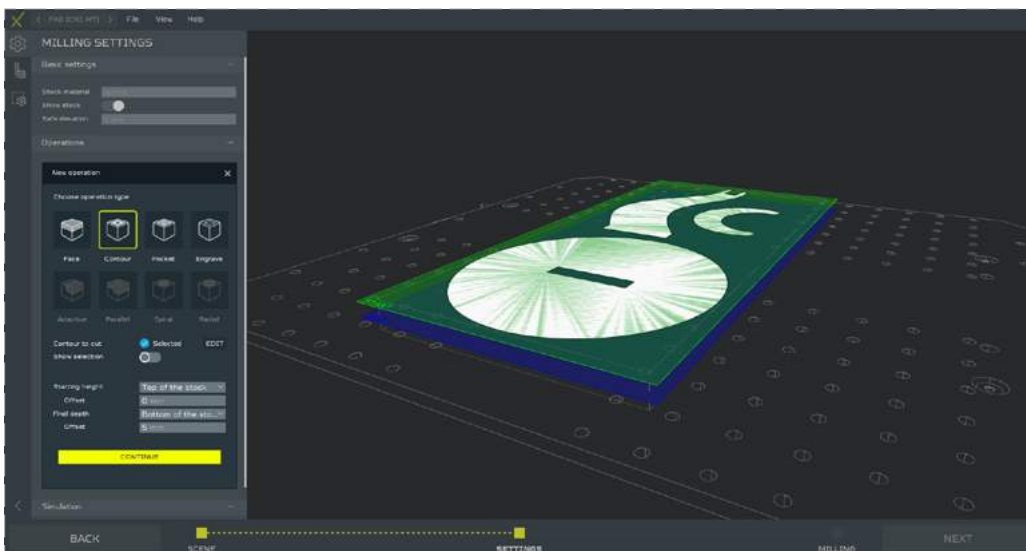
# CNC milling workflow



At this point it is still possible to modify the selected contours for this operation. To proceed further, press the CONTINUE button.

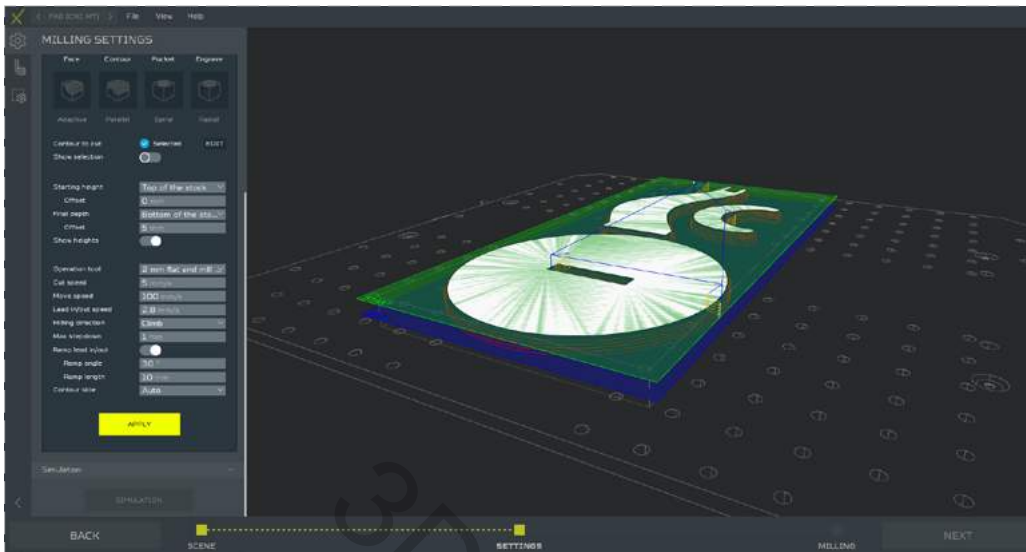


Next, choose the STARTING HEIGHT, FINAL DEPTH and their respective offsets.

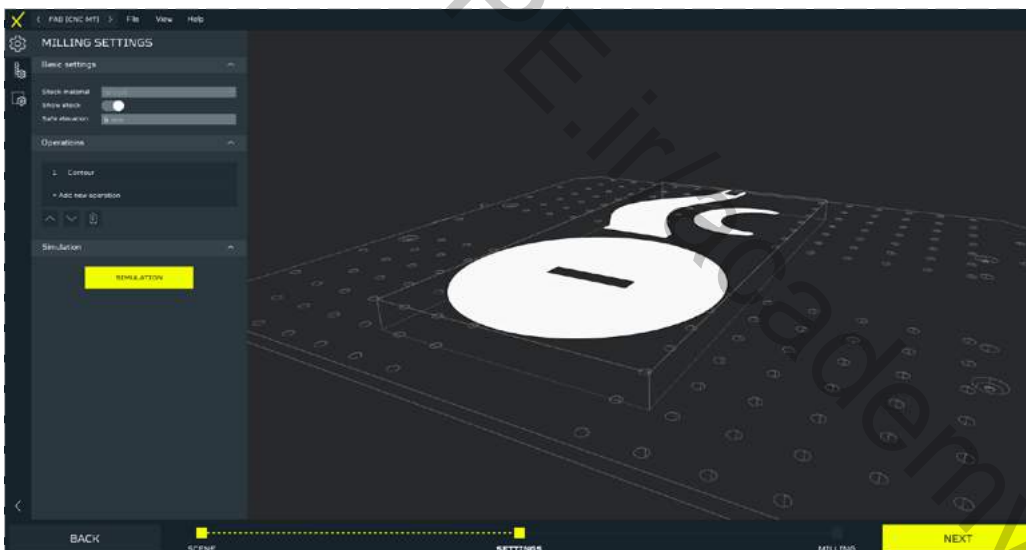


To proceed further, press the CONTINUE button.

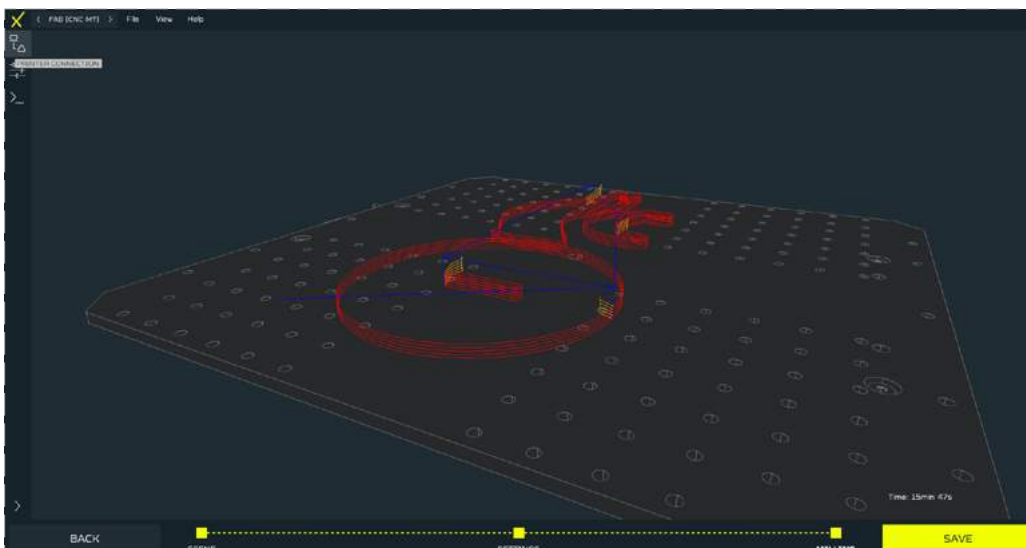
# CNC milling workflow



Choose an operation tool. Parameters are set by default - adjust them according to your needs.



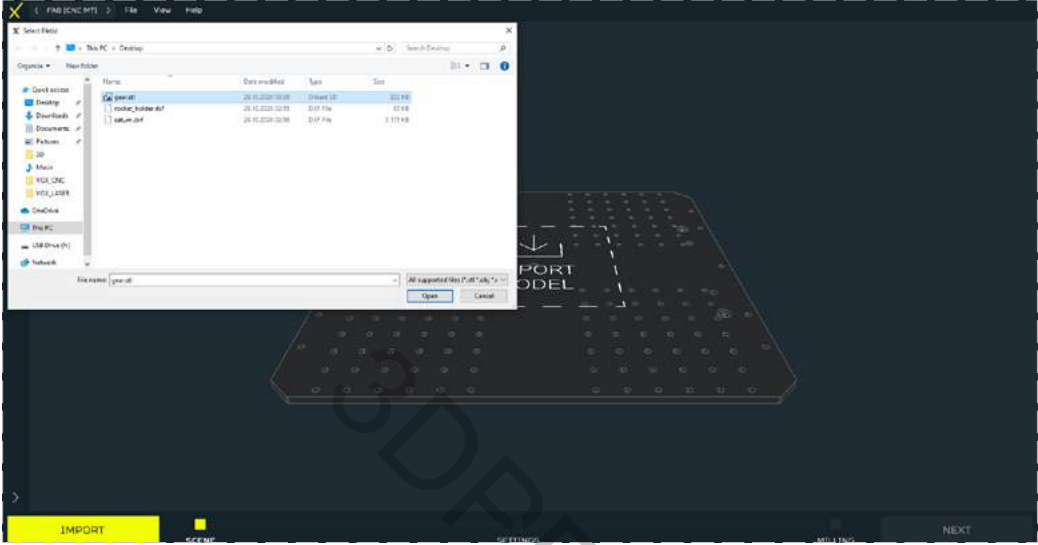
Apply operation settings. At this point it is still possible to add and delete operations. When all operations are ready, click NEXT and wait for your G-code to be generated.



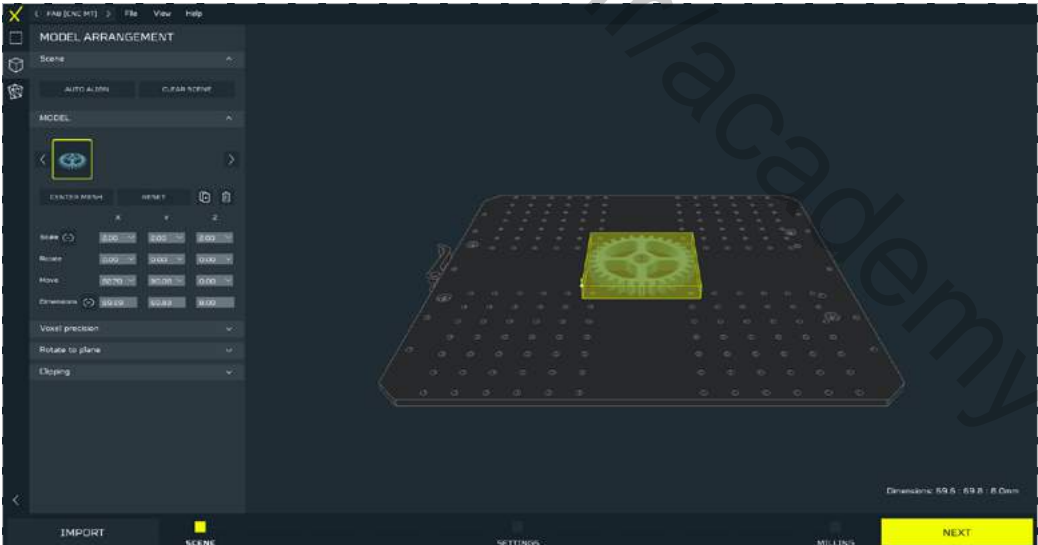
Now you can check the generated G-code and save it. Start your file according to the 13.6 part of the manual.

# CNC milling workflow

## 3D Milling

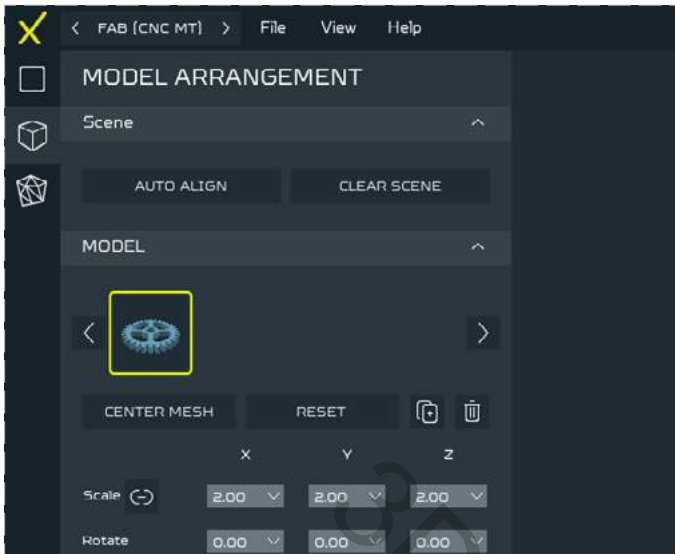


Import a .STL or .STEP file type.

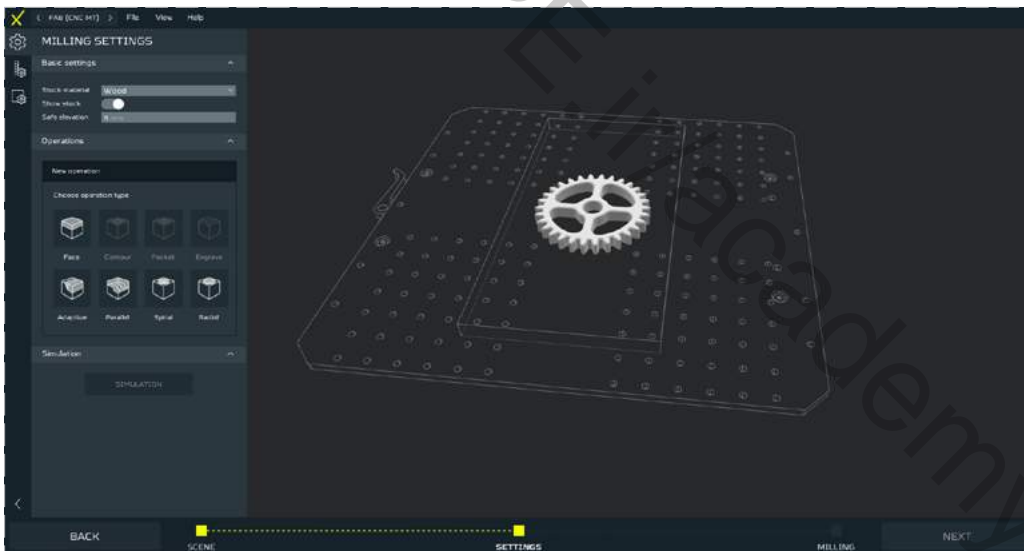


The material dimensions (by default) will automatically adjust to the model dimensions (with a 1mm offset from the edges).

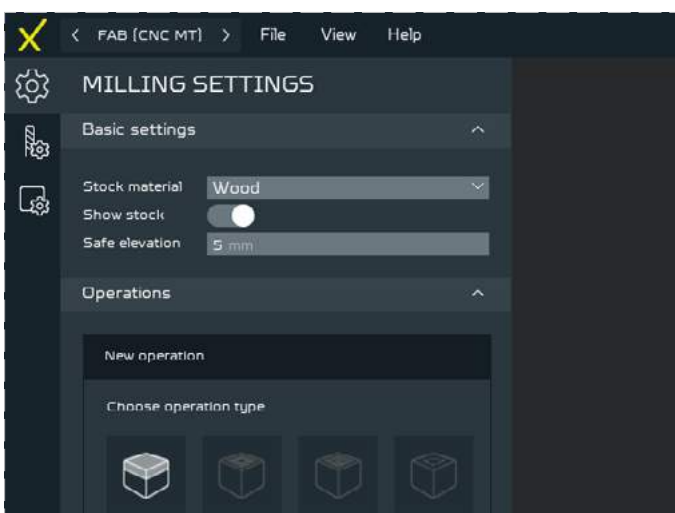
# CNC milling workflow



To be able to freely move, scale and rotate the model on the table preview go to MODEL ARRANGEMENT menu.



Click NEXT when ready. You will be automatically moved to SETTINGS tab.



Choose Stock material from the drop down list and set Safe elevation for travel - remember to take into account any fixtures that might stick out over the material surface.

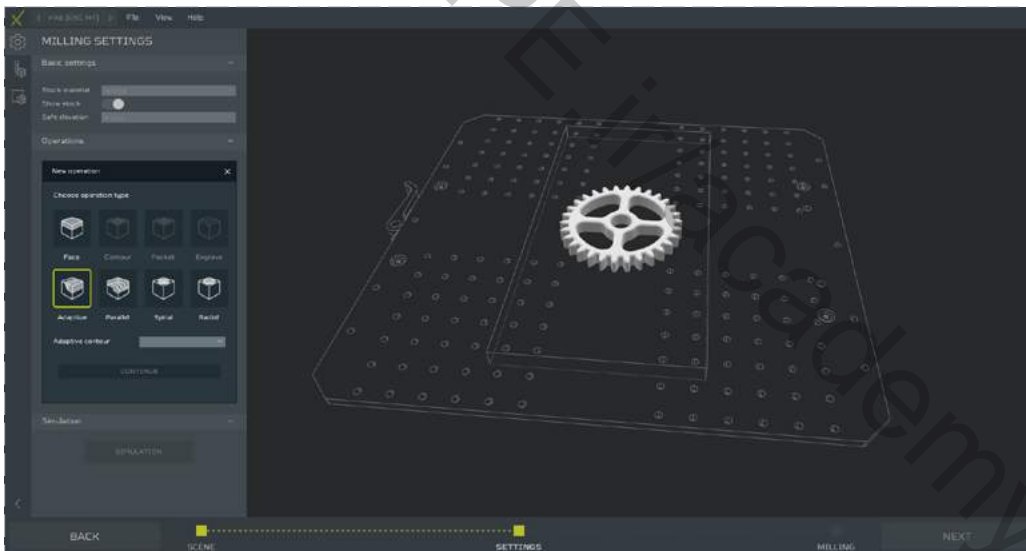
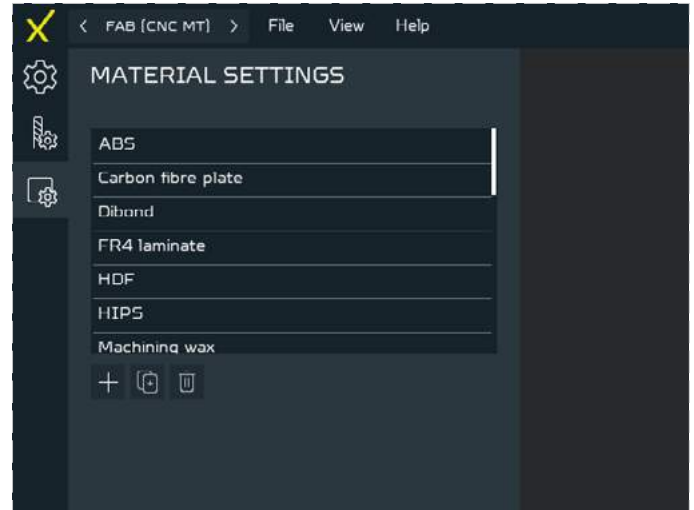
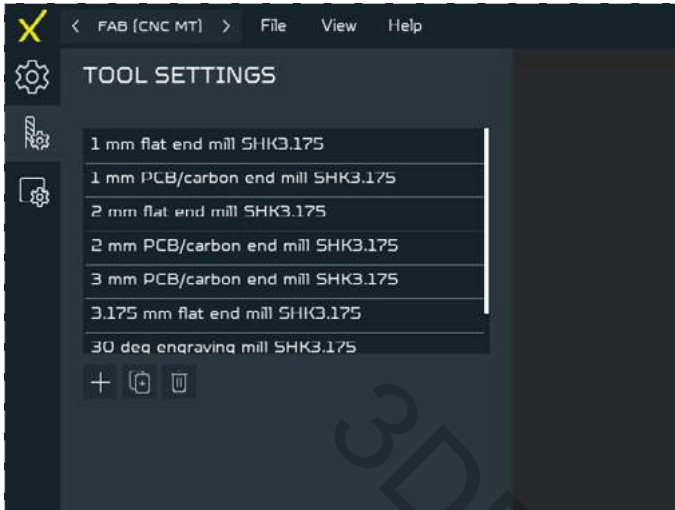
## NOTE

By pressing the SHOW STOCK parameter it will turn ON the material visualization.

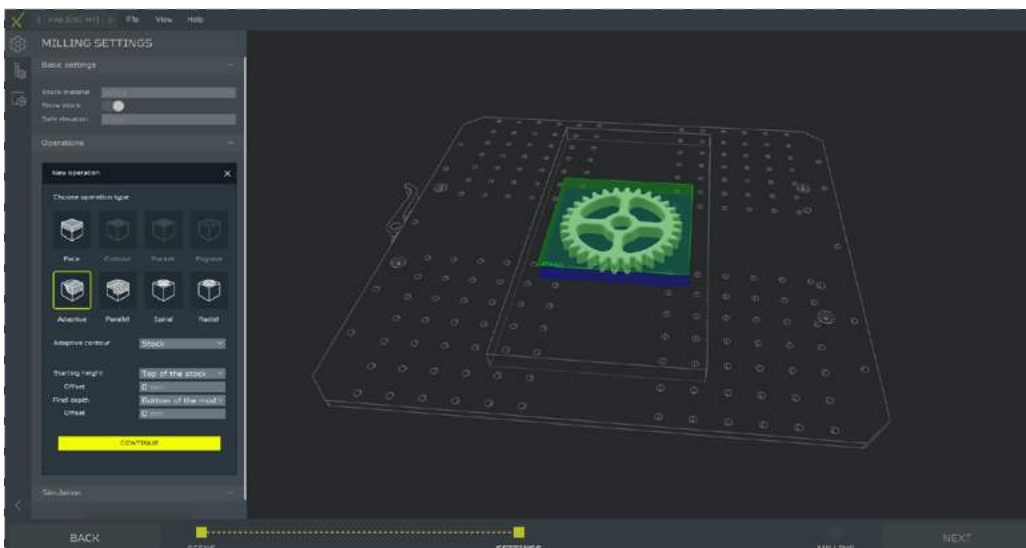


# CNC milling workflow

You can define your Cutting Tool and Stock material in the TOOL and MATERIAL SETTINGS menu.

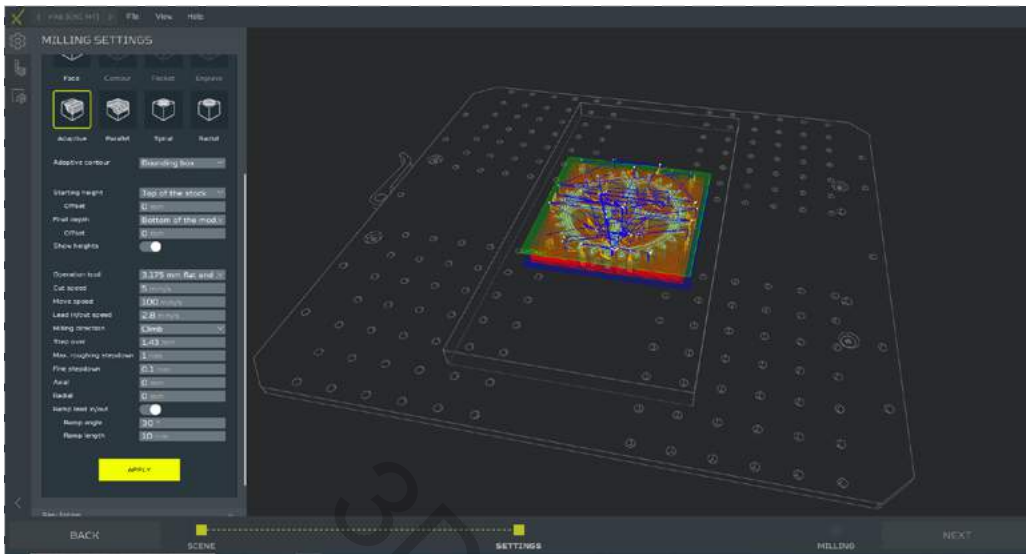


To start working with the model first choose the operation that you would like to mill with. Next choose a contour from the drop list (or depending on the operation press the SELECT button to choose the Surface/Center point) to cut from it with the operation. When finished press the CONTINUE button.

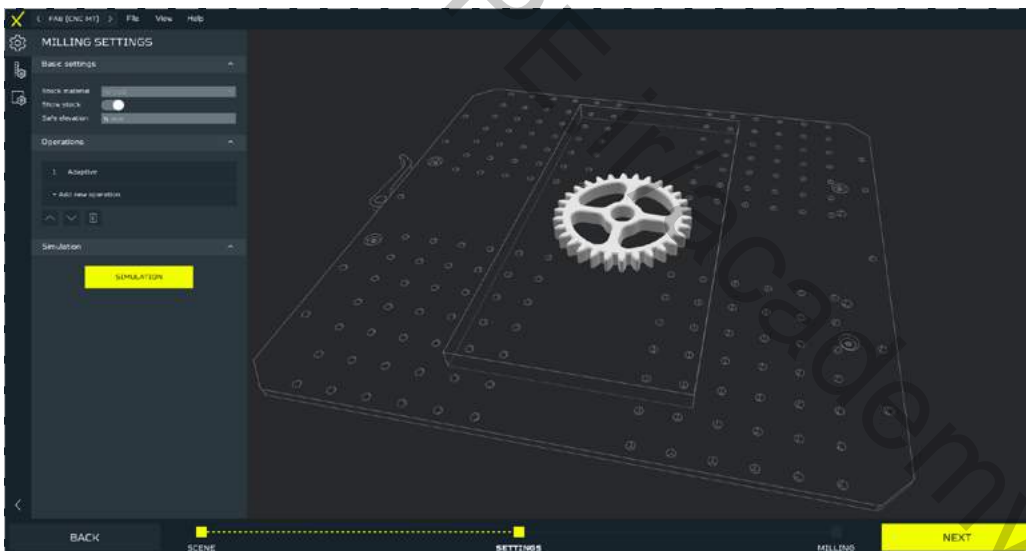


Next, choose the STARTING HEIGHT, FINAL DEPTH and their respective offsets. To proceed further, press the CONTINUE button.

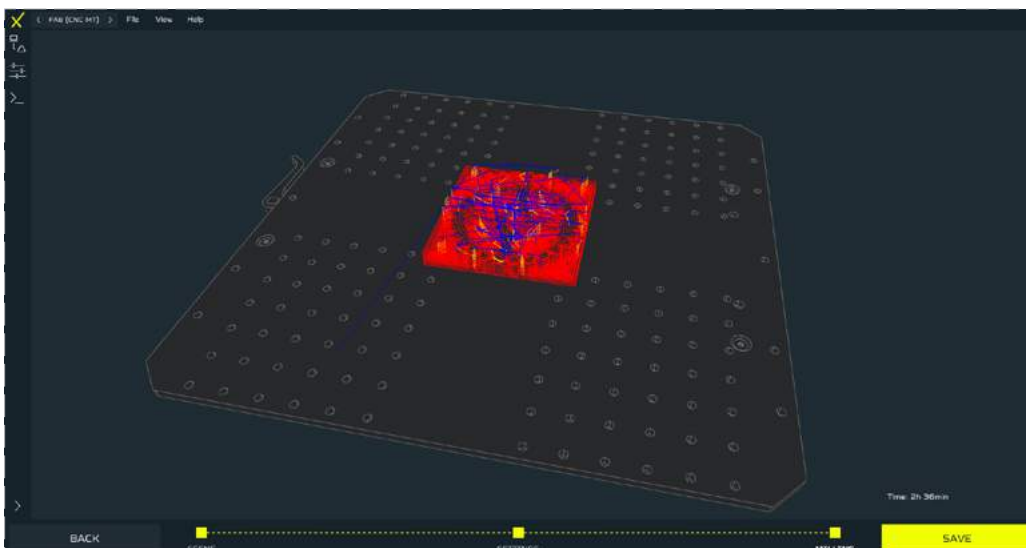
# CNC milling workflow



Choose an operation tool. Parameters are set by default - adjust them according to your needs.



Apply operation settings. At this point it is still possible to add and delete operations. When all operations are ready, click NEXT and wait for your G-code to be generated.

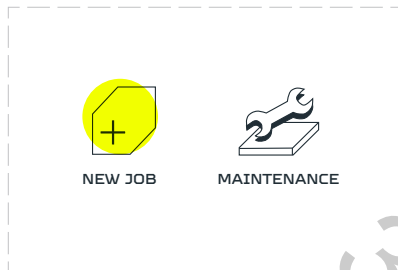


Now you can check the generated G-code and save it. Start your file according to 13.6 part of the manual.

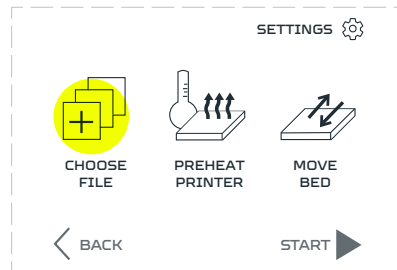
# CNC milling workflow

## 13.6 CNC milling file starting (with calibration)

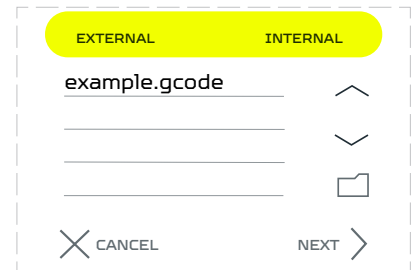
After uploading the file to an internal card or inserting an external SD card with the prepared file:



Enter the 'NEW JOB' menu.



Go to the 'CHOOSE FILE' section.



Files uploaded to the internal SD card are located in the 'INTERNAL' tab, files uploaded to the SD card are located in the 'EXTERNAL' tab.

### NOTE

If the user inserted the external SD card the screen should jump forward to the 'CHOOSE FILE' section screen on the 'EXTERNAL' directory.

If there was no previously chosen file, after pressing on the 'NEW JOB' menu the screen will go directly to the 'CHOOSE FILE' section.



Select the prepared G-code file.



If the prepared file or folder is not visible on the list press the up/down arrow buttons to navigate through the file list.



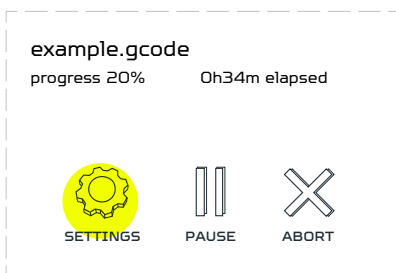
Exiting the folder is done by selecting the folder icon.

# CNC milling workflow

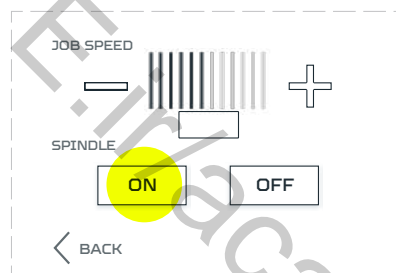


After selecting the file, press 'NEXT'.

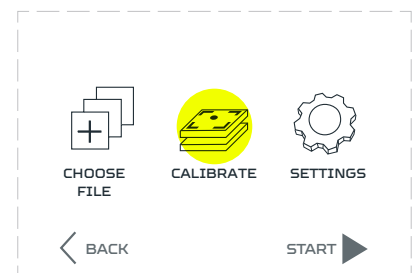
Before starting the CNC milling process the machine must be calibrated to the mounted material on the worktable. Skipping the calibration process may result in damaging the milling cutter, machine or the tool-head and after that hurting the user.



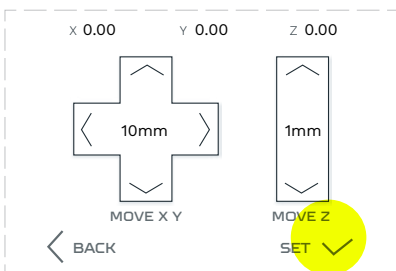
Enter the 'SETTINGS' section.



Turn 'ON' your Spindle.



Go to the 'CALIBRATE' section.



Press 'SET'.

## NOTE

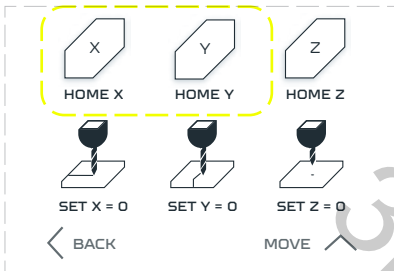
The movement in the X and Y axes will be disabled until they are homed. It is a safety procedure, to protect the machine against damage.

The movement in the Z axis is available all the time. Use it to move the milling cutter above the surface height of the prepared material

# CNC milling workflow

## NOTE

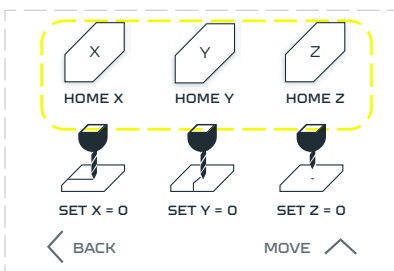
The information on the Z axis height is stored in the motherboard internal memory. That is guided by the fact that this value is not easy to change manually by the user unlike the X and Y axes



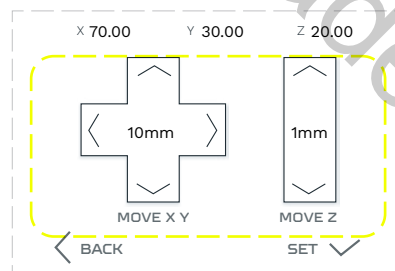
Press the 'HOME X' and 'HOME Y' buttons. Watch out for your cutter not to hit the material on the worktable.

## NOTE

Don't home the Z axis when the milling cutter is in the spindle and when there is material on the CNC worktable. This will damage the milling cutter and might disarrange the Z axis motors.



Go back to 'MOVE' menu



Using provided arrow buttons, move the spindle to the FRONT-LEFT corner of material.

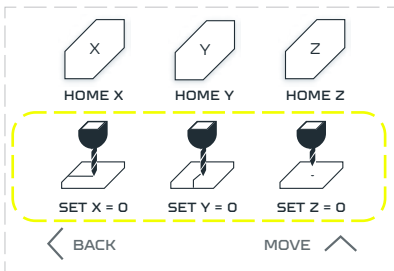


## NOTE

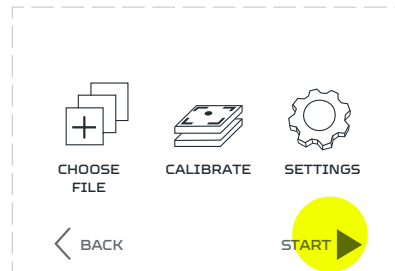
In most cases the local starting position will be the material surface left, front corner.

Toggle the distance button for better control over the cutter.

# CNC milling workflow



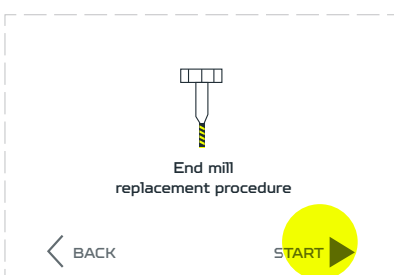
When the cutter is in its local position, go to the 'SET' menu and set the local 0,0,0 coordinates by pressing the 'SET X = 0', 'SET Y = 0' and 'SET Z = 0' buttons.



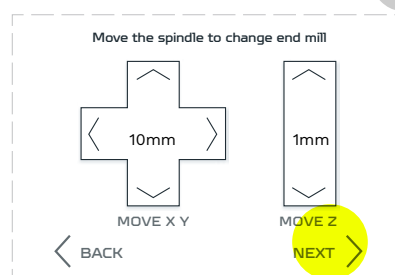
Go back to the main menu and choose 'START'. Your machine will start working.

## 13.7 Tool changing process

If you have generated a milling G-code with tool changes, machine will stop operation at the right moment and ask if cutter changing process should be executed.



If you selected 'start procedure' you will be walked through the process.

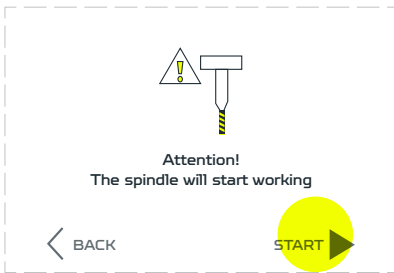


Using arrows move the toolhead to a convenient position. Watch out for any workholding that may stick out above material surface. Choose 'NEXT' when ready.

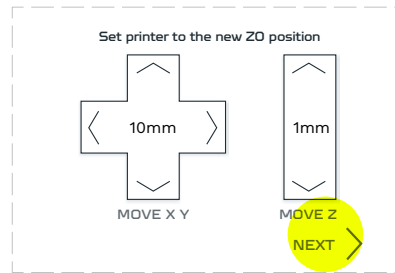


As seen in chapter 13.4 loosen the collet's nut. Because your toolhead is still mounted on X-carriage, you will need to slide the 13 wrench under the toothed belts and find a slot for it on spindle's shaft. This way the positions for X and Y axis is saved. Replace your endmill Choose 'NEXT' when ready.

# CNC milling workflow



The machine will inform that the spindle will start working. Press 'START' to continue.



Set new Z-height of your cutter. Using arrows move the toolhead to position which will be your new Z-0 position. Make sure to use the same surface as in the begging of gcode file. Choose 'NEXT' when ready.



Close the covers. The machine will go back to milling operations.

## 13.8 CNC Milling Toolhead safety rules

### Preparing the workstation

- Secure the room with the Zmorph Fab machine against any improper usage (the key to the room should be held only by a person authorized to operate the machine),
- Mark the entrance door to a room where a machine with a working CNC Milling Toolhead is used with a suitable sign to wear hearing protectors (e.g. headphones, stoppers),
- Depending on the material being processed, the CNC spindle can produce a noise level up to 70dB. The noise is not a risk of hearing damage, but can cause discomfort and stress due to prolonged exposure to a working device,

### 'Hearing protection required' sign



- Mark the entrance to the room where a machine with the CNC Milling Toolhead is with a proper sign saying that eye protection is required,



# CNC milling workflow

---

## 'Eye protection required' sign



- When working with the device with the spindle attached without covers (e.g. if material is larger than the platform), provide the personnel and bystanders in the room with safety goggles,
- The electrical installation of the Zmorph Fab requires it to be connected to a grounded outlet,
- Place the device on a level and stable surface. The machine is equipped with a vibration-damping base but when working on uneven or sloping surface, vibrations can cause the device to move,
- The room where the Zmorph Fab device with the CNC Milling Toolhead is located must be well ventilated as vapours may escape from the device during operation,
- If you install a Zmorph Fab device with the CNC Milling Toolhead in a room where smoke detectors are installed, make sure they do not cause false alarms.

## Health and safety instructions for handling CNC Milling Toolhead.

### General information.

- Use the Zmorph Fab device with the CNC Milling Toolhead in a separate room which cannot be accessed by children or unauthorized persons,
- Do not put your hands in the workspace after turning on the spindle. The spindle rotates at high speed and has rotating blades that can cause serious injuries,
- Use of the machine by unqualified personnel can lead to injury and/or damage to the machine,
- If you notice any malfunctions of the machine, stop it immediately by pressing the reset button (red ring button on the right on the front panel of the machine) and contact Zmorph Technical Support,
- Do not use a malfunctioning machine under the risk of voiding the warranty,
- Make sure that the material to be machined is firmly attached to the work platform and cannot move in any direction. Failure to follow the instructions may result in injury and/or damage to the machine,
- When using a Zmorph Fab machine with the CNC Milling Toolhead without covers, both operators and bystanders must always wear safety goggles; failure to do so may result in eye damage.

# CNC milling workflow

---

## Safety at work

- Do not place your hands in the workspace under any circumstances after starting the spindle. Any exposure of the body to rotating parts of the machine can lead to a serious injury. It is therefore essential to use the device safely and in accordance with the instructions,
- The Zmorph Fab with CNC Milling Toolhead mounted and running cannot be left unattended,
- The use and maintenance of the machine must always be carried out in the manner described in the operating instructions,
- Under no circumstances should you open covers that conceal electronic components of the machine when the power supply is connected. If there is a need for repairs or an overhaul of components contact Zmorph Technical Support. For local repairs, the housing may only be removed after the machine has been disconnected from the power supply and the plug has been disconnected from the socket,
- Make sure the room ventilation is working properly,
- The workpieces and tools must be mounted in a stable manner at the correct locations. Avoid collision between the workpiece and the machine otherwise, the machine may be damaged,
- Before starting work, check that there are no obstacles in the working area.
- Stop all operations while the workpiece is being changed,
- Do not touch electrical parts with wet hands.

## Warning signs



Caution: Danger from moving parts. To avoid injury or damage to parts of the body, do not reach inside the unit or insert any foreign objects while the unit is in operation, during operation or at rest.



Caution: High voltage - this symbol indicates the area where the user may be electrocuted.

# 14. Laser cutting and engraving workflow

## 14.1 Laser Toolhead

Laser is a toolhead used for cutting and engraving operations. It consists of a 2.8 W diode laser in full aluminum casing and mounting that allows for attachment of the toolhead to X carriage of Zmorph Fab machine.

Main elements of Laser Toolhead:



### Specification:

- Construction: High quality CNC-milled aluminum
- Laser type: 2.8W class 4 Blue Laser
- Default work speed: 15 mm/s
- Max work speed: 120 mm/s
- Work area: up to 250 x 235 x 85 mm
- Recommended cutting depth: 1 mm for cardboard
- Max cutting depth: 5 mm for cardboard
- Dimensions: 90 x 55 x 165 mm

# Laser workflow

---

## 14.2 Materials compatible with Laser Toolhead

Laser Toolhead allows for engraving and cutting in soft materials.

The list of tested materials is as follows:

- Wood derivatives: wood, plywood, wood fibre boards.
- Plastics: EPP, EVA foam.
- Others: leather, felt, laser foil, cardboard, foamiran.

To explore all materials please follow this link to Zmorph Materials Library:

[bit.ly/ZmorphMaterialsLibrary](https://bit.ly/ZmorphMaterialsLibrary)

## 14.3 Material fixturing

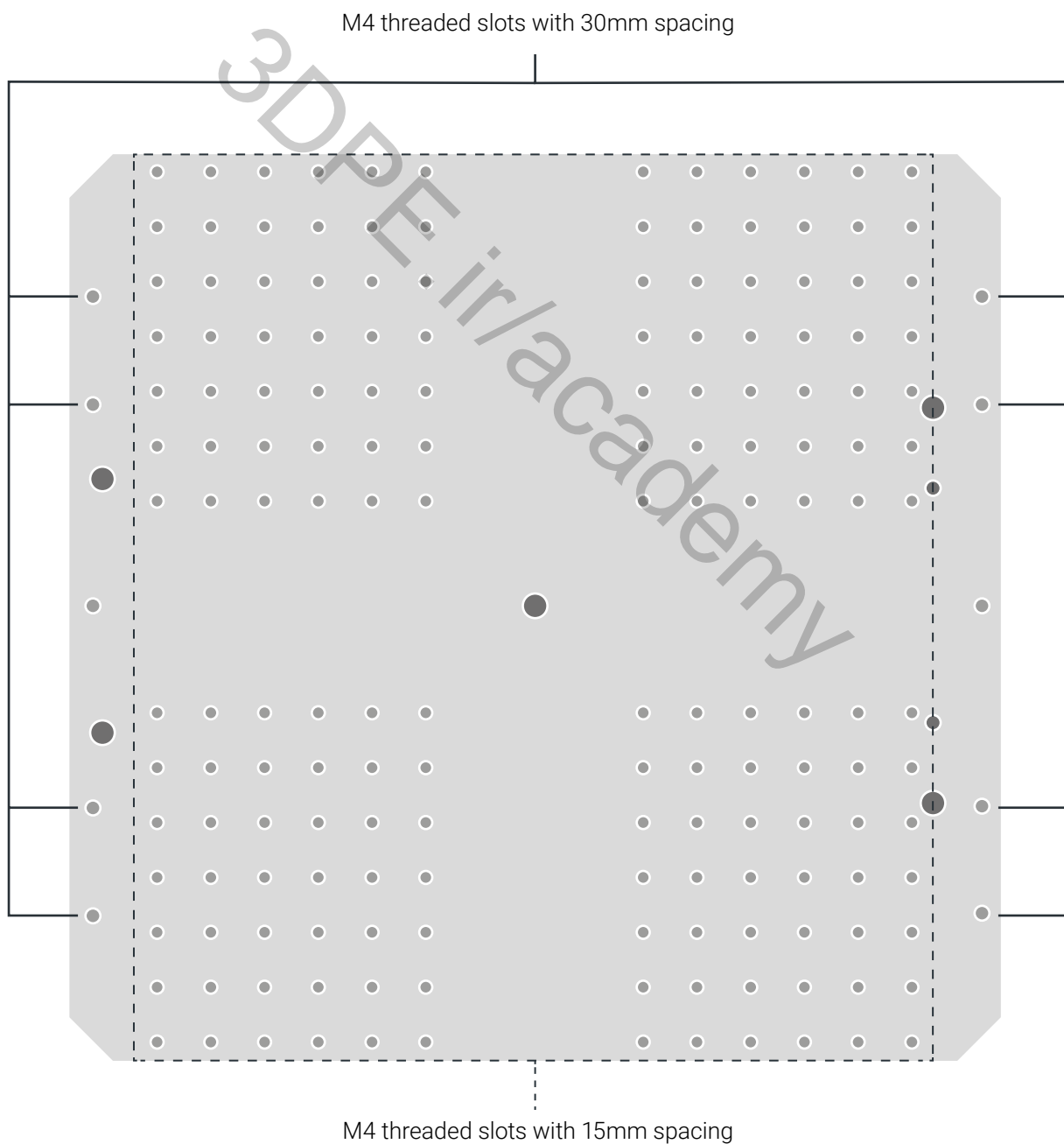


For proper material fixturing during CNC milling operation you need to mount aluminium bed that is added to every Zmorph Fab Full Set or is available in store. To learn how to change your worktable, follow next parts of the manual.

# Laser workflow

## CNC Worktable explained

The CNC worktable has been designed for easy and intuitional material fixturing. Along with the CNC table were designed clamps adapted to the table. Table with dimensions of 259mm x 250mm has M4 168 threaded mounting holes with a spacing of 15mm for materials not covering the entire surface of the table and 8 threaded holes with a spacing of 30mm located on the edges corner enabling fastening of materials taking up the entire working area.



# Laser workflow

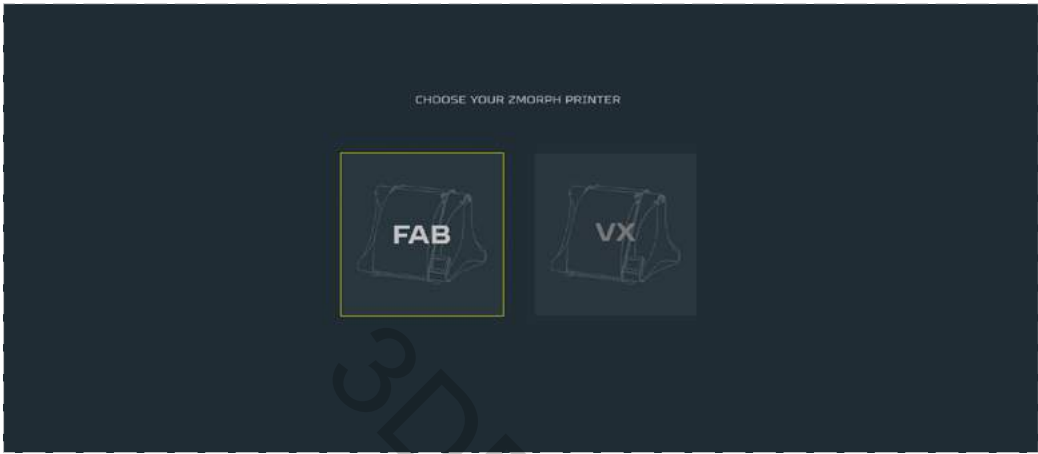
## Types of workholding solutions

Your workholding solution should be adapted to material and its dimensions to ensure best results. Below you can find most common solutions with pros and cons of every one of them.

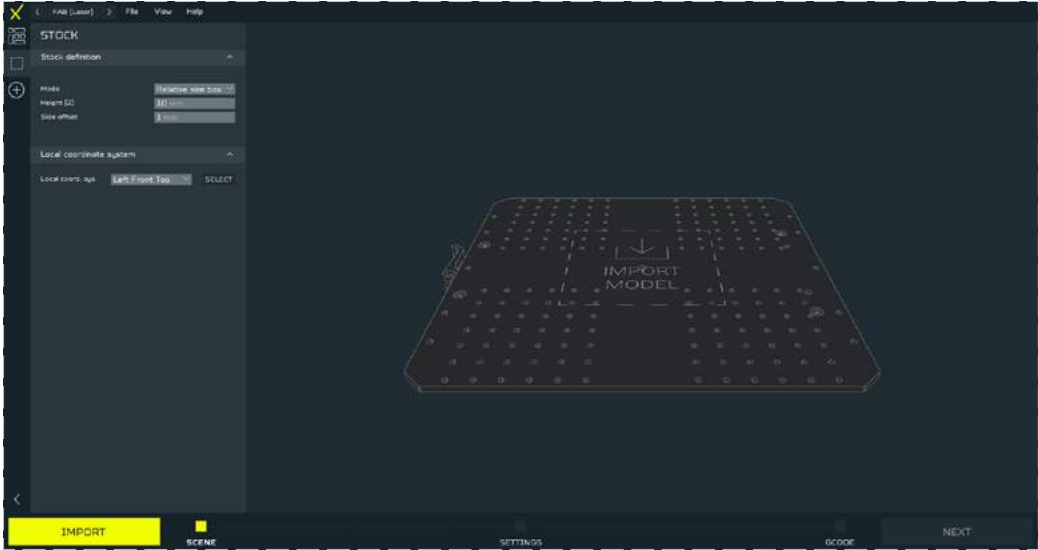
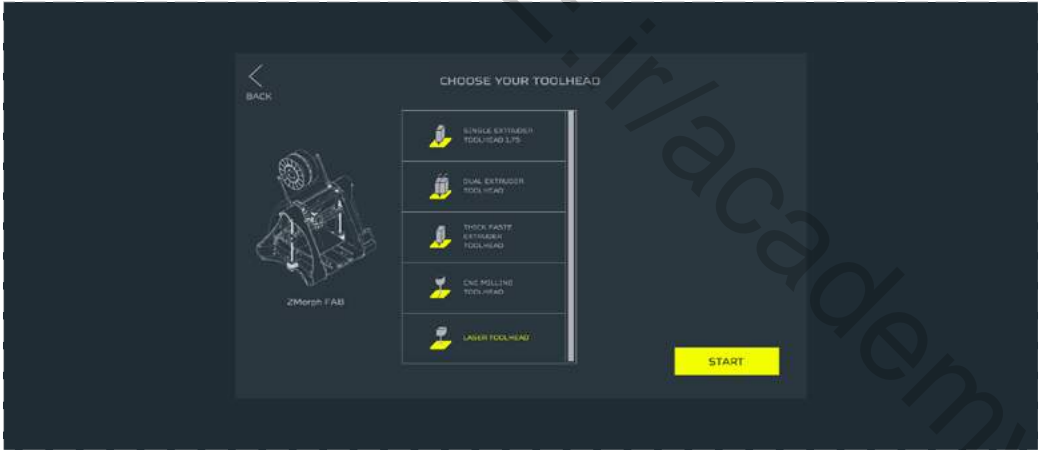
Workholding	Usable for	Pros	Cons	Ease of use
Corner Clamp 	<ul style="list-style-type: none"> <li>■ Sheet material.</li> <li>■ Block material.</li> </ul>	<ul style="list-style-type: none"> <li>■ Can be custom 3d printed.</li> </ul>	<ul style="list-style-type: none"> <li>■ Passive, holds the material poorly by itself.</li> </ul>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Side Clamp 	<ul style="list-style-type: none"> <li>■ Sheet material.</li> <li>■ Block material.</li> </ul>	<ul style="list-style-type: none"> <li>■ Can be custom 3d printed.</li> </ul>	<ul style="list-style-type: none"> <li>■ Passive, holds the material poorly by itself.</li> </ul>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Toe Clamp 	<ul style="list-style-type: none"> <li>■ Block material.</li> </ul>	<ul style="list-style-type: none"> <li>■ Can be custom 3d printed.</li> <li>■ Adjustable.</li> </ul>	<ul style="list-style-type: none"> <li>■ Take a lot of workspace.</li> </ul>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Eccentric clamp 	<ul style="list-style-type: none"> <li>■ Sheet material.</li> </ul>	<ul style="list-style-type: none"> <li>■ Can be custom 3d printed.</li> <li>■ Adjustable.</li> </ul>	<ul style="list-style-type: none"> <li>■ Harder to use.</li> <li>■ Only for flat, sheet materials like plywood.</li> <li>■ Take a lot of workspace.</li> </ul>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Top Clamp 	<ul style="list-style-type: none"> <li>■ Sheet material.</li> <li>■ Block material.</li> </ul>	<ul style="list-style-type: none"> <li>■ Can be custom 3d printed.</li> <li>■ Allow for mounting materials of different heights.</li> </ul>	<ul style="list-style-type: none"> <li>■ Stick out above material surface.</li> </ul>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

# Laser workflow

## 14.4 Laser engraving file preparation



Open Voxelizer software and choose Zmorph Fab machine, Laser Toolhead and click the START button.



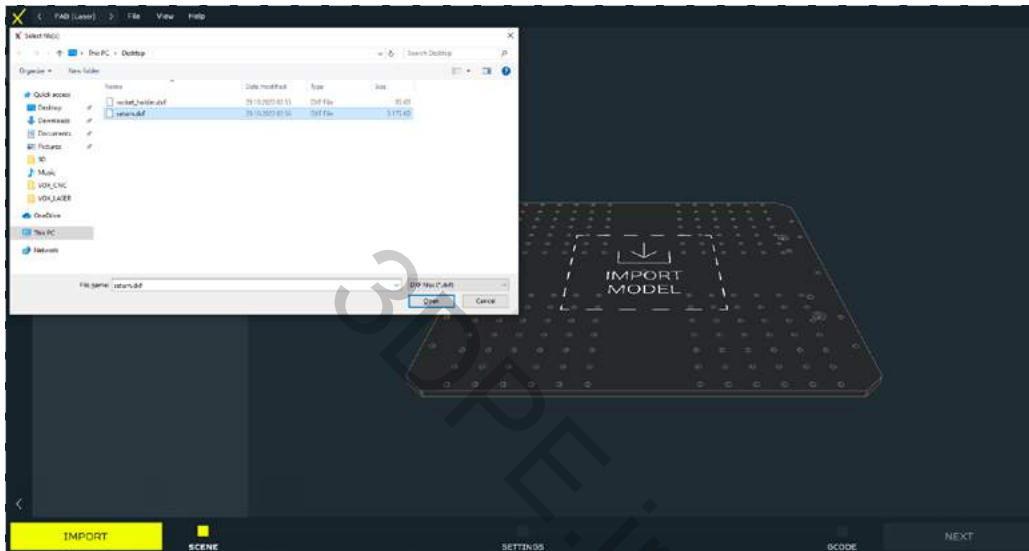
Import your file by pressing the IMPORT button or the IMPORT MODEL sign on the table.



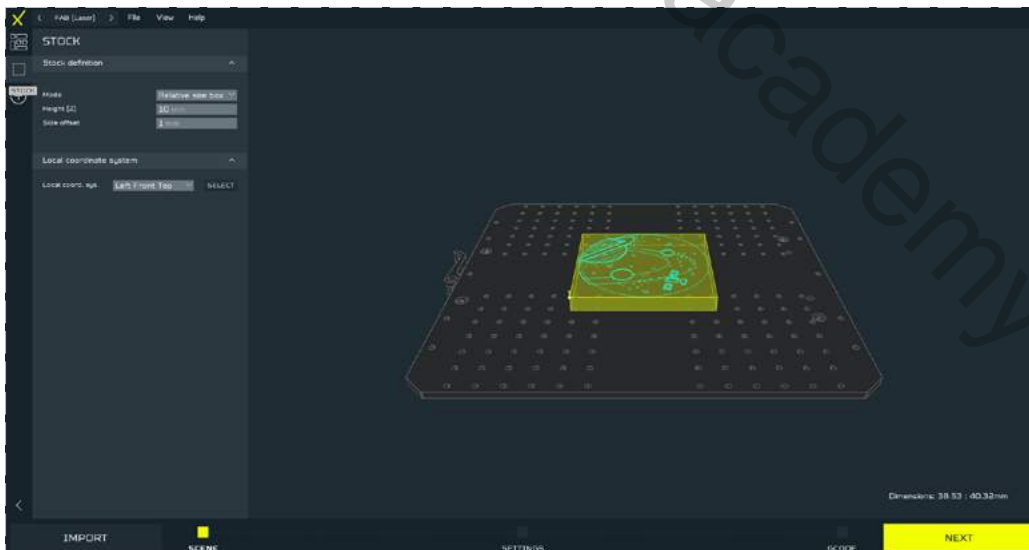
# Laser workflow

## NOTE

You can also drag & drop the file into the software from your computer



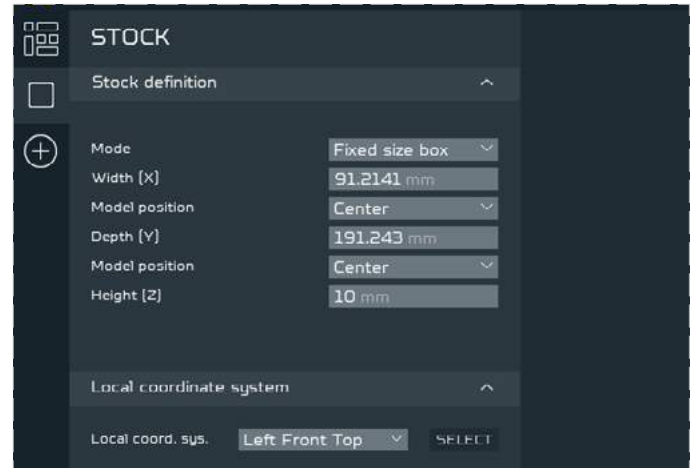
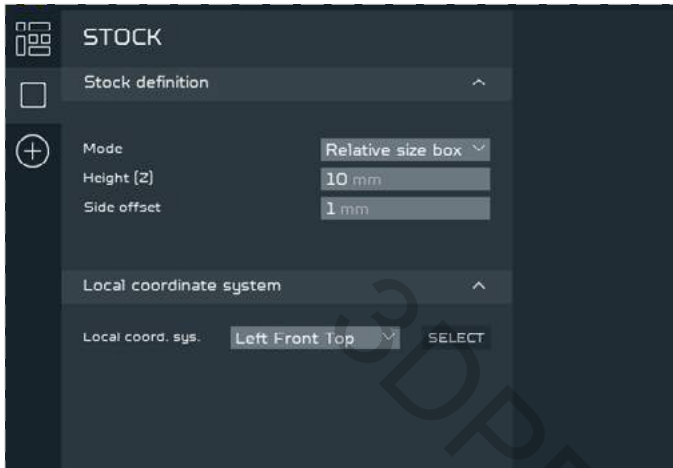
Import a .DXF file type.



The material dimensions (by default) will automatically adjust to the model dimensions (with a 1mm offset from the edge).

# Laser workflow

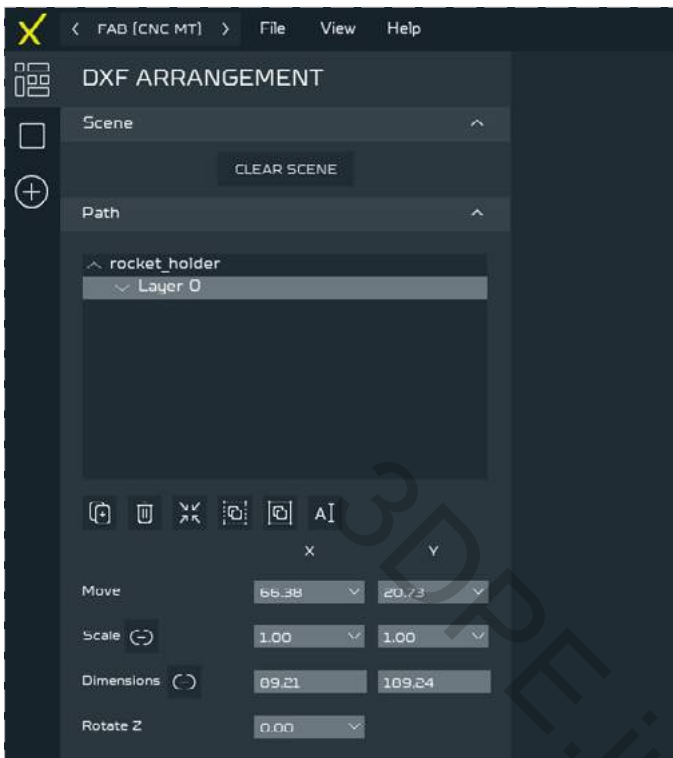
To set material dimensions manually to match the Raw material that would be used for milling, change the MODE in the STOCK DEFINITION parameters from RELATIVE to FIXED



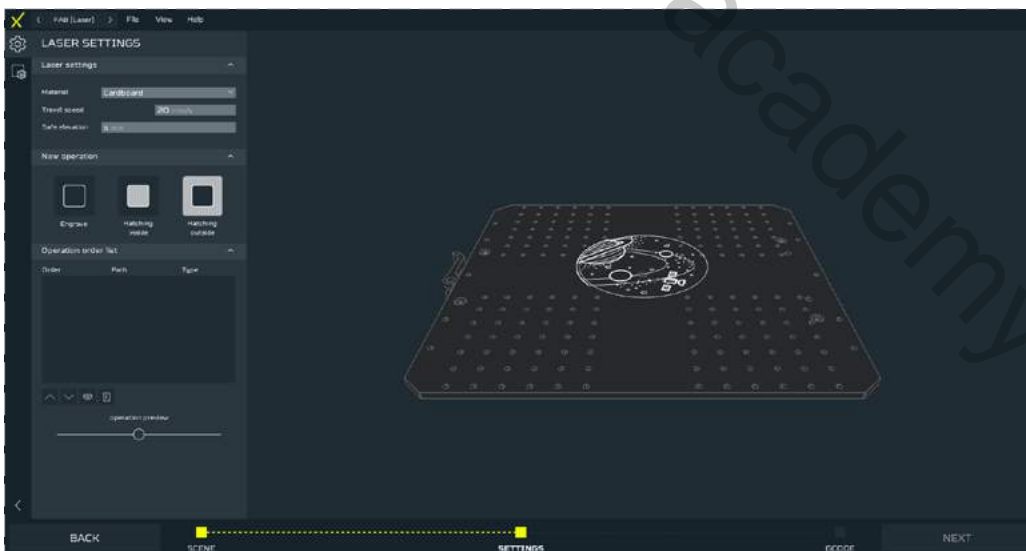
## NOTE

The 'Local coordinate system' is a parameter responsible for setting the local 0,0,0 point in the .Gcode file from which all the spindle operations should be started. It is important to set the same local point before starting the milling. How to Set the local 0,0,0 point on the machine see [chapter 13.6](#)

# Laser workflow

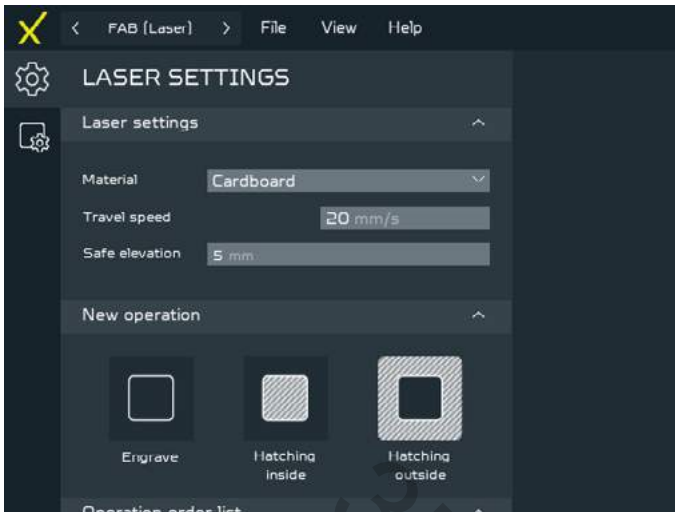


To be able to freely move, scale and rotate the model on the table preview go to DXF ARRANGEMENT menu.

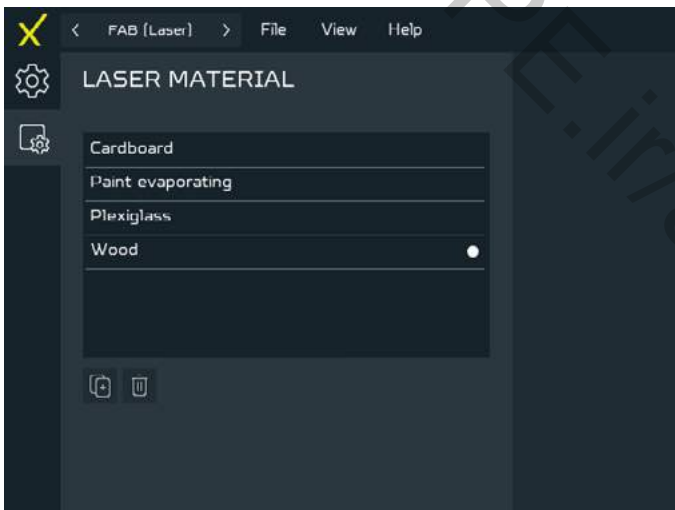


Click NEXT when ready. You will be automatically moved to the SETTINGS tab.

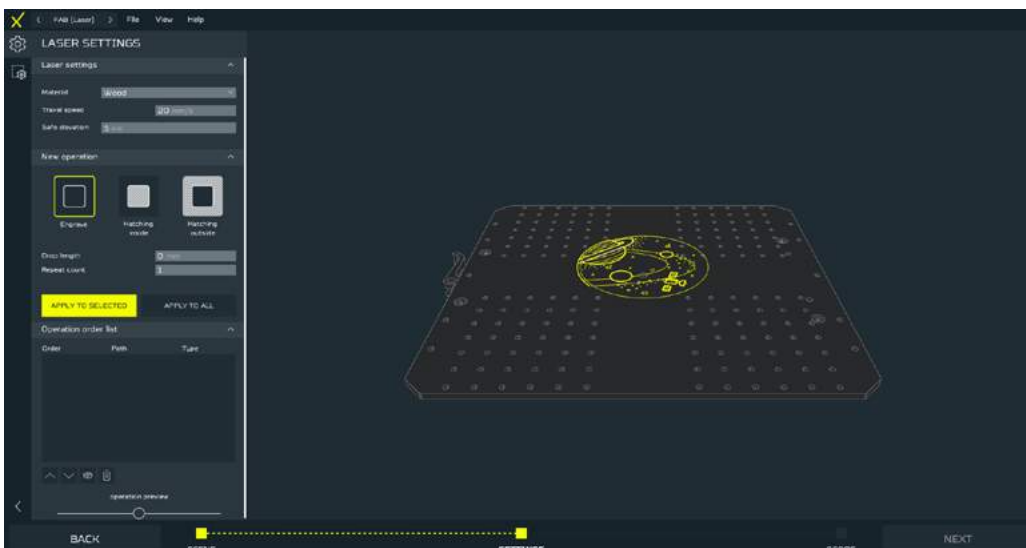
# Laser workflow



Choose Material from the drop down list and set Safe elevation for travel - remember to take into account any fixtures that might stick out over the material surface.

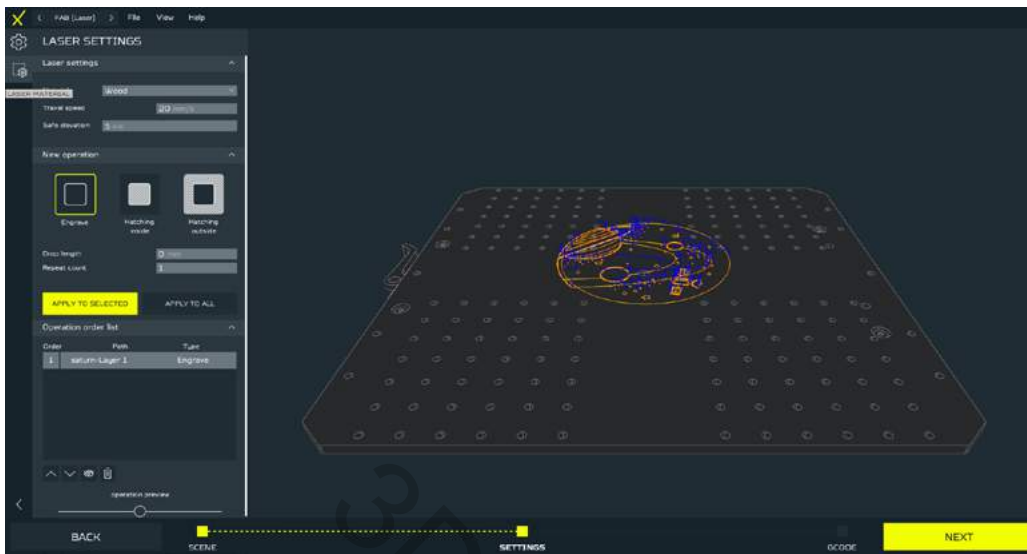


You can define your Material in the MATERIAL SETTINGS menu.



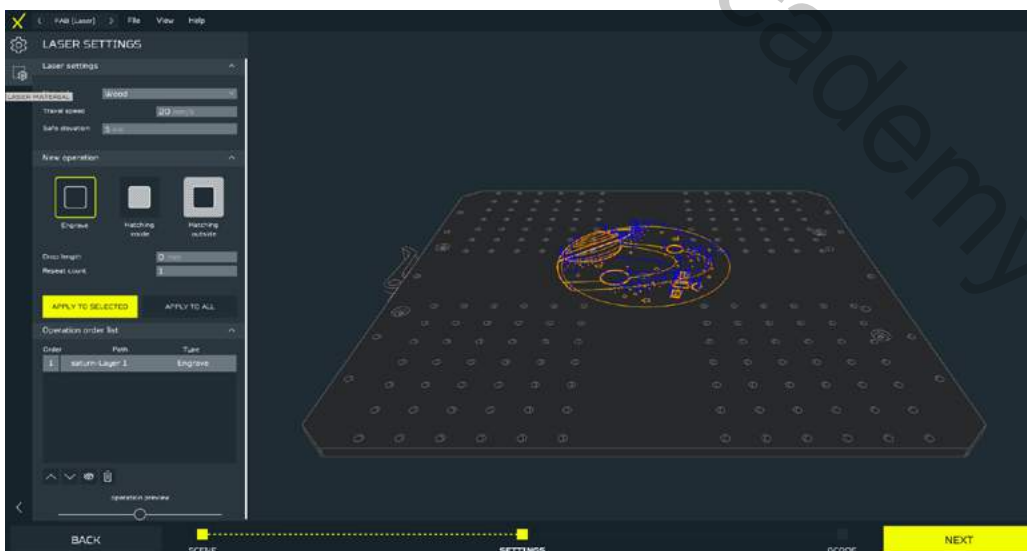
To start working with the model first choose the operation that you would like to engrave with. Next press the correct Contour to cut with the operation and confirm it with the APPLY TO SELECTED button.

# Laser workflow



## NOTE

It is possible to select multiple contours at once for one operation.

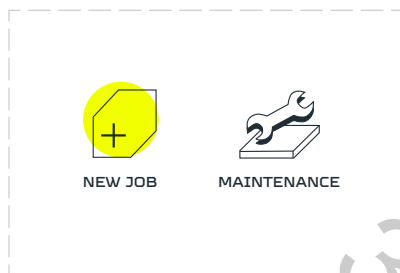


When all operations are ready, click NEXT and wait for your G-code to be generated. Now you can check the generated G-code and save it. Start your file according to the 14.5 part of the manual.

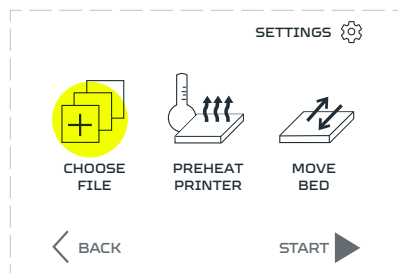
# Laser workflow

## 14.5 Laser engraving/cutting file starting (with calibration)

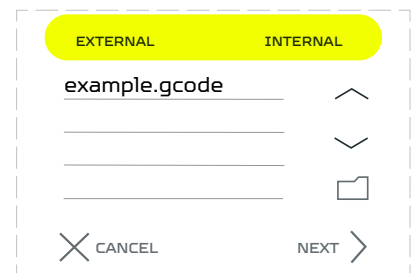
After uploading the file to an internal card or inserting an external SD card with the prepared file:



Enter the 'NEW JOB' menu.



Go to the 'CHOOSE FILE' section.



Files uploaded to the internal SD card are located in the 'INTERNAL' tab, files uploaded to the SD card are located in the 'EXTERNAL' tab.

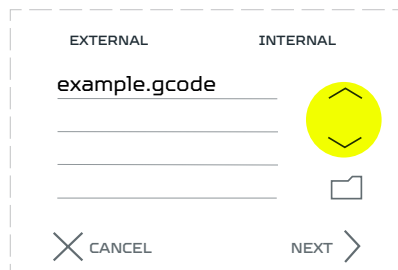
### NOTE

If the user inserts the external SD card, the screen should jump forward to the 'CHOOSE FILE' section screen on the 'EXTERNAL' directory.

If there was no previously chosen file, after pressing on the 'NEW JOB' menu the screen will go directly to the 'CHOOSE FILE' section.



Select the prepared G-code file.



If the prepared file or folder is not visible on the list press the up/ down arrow buttons to navigate through the file list.



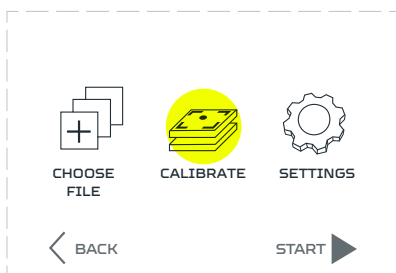
Exiting the folder is done by selecting the folder icon.

# Laser workflow

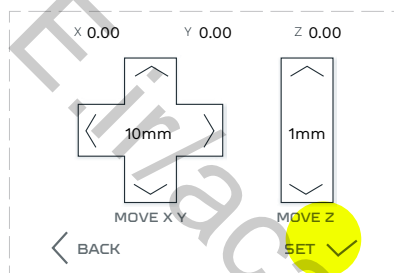


After selecting the file, press 'NEXT'.

Before starting the Laser engraving/cutting process the machine must be calibrated to the mounted material on the worktable. Skipping the calibration process may result in damaging the machine or the toolhead.



Go to the 'CALIBRATE' section.



Press 'SET'.

## NOTE

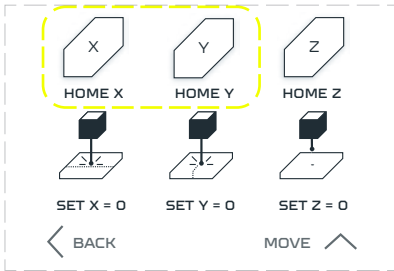
The movement in the X and Y axes will be disabled until they are homed. It is a safety procedure, to protect the machine against damage.

The movement in the Z axis is available all the time. Use it to move the milling cutter above the surface height of the prepared material.

The information on the Z axis height is stored in the motherboard internal memory. That is guided by the fact that this value is not easy to change manually by the user unlike the X and Y axes.



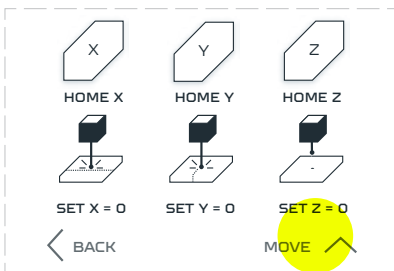
# Laser workflow



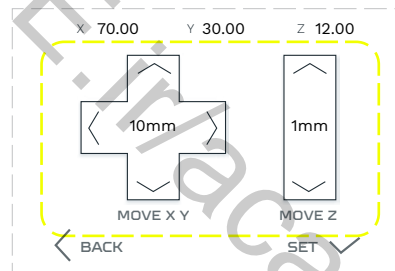
Press the 'HOME X' and 'HOME Y' buttons. Watch out for your cutter not to hit the material on the worktable.

## NOTE

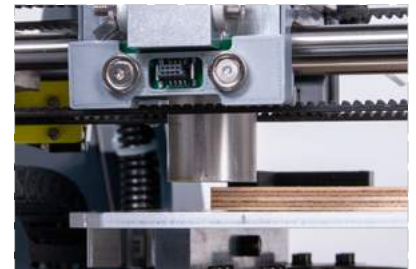
Don't home the Z axis when there is material on the worktable. This will cause the laser tube to hit the material and might disarrange the Z axis motors.



Go back to 'MOVE' menu.



Using provided arrow buttons, move the tube to the FRONT-LEFT corner of material.

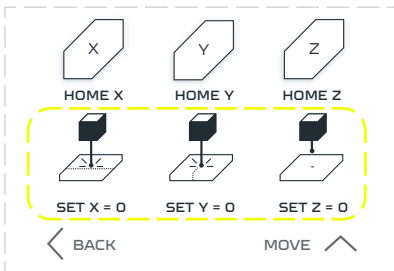


## NOTE

In most cases the local starting position will be the material surface left, front corner.

Toggle the distance button for better control over the laser tube.

# Laser workflow



When the cutter is in its local position, go to the 'SET' menu and set the local 0,0,0 coordinates by pressing the 'SET X = 0', 'SET Y = 0' and 'SET Z = 0' buttons.



Go back to the main menu and choose 'START'. Your machine will start working.

## 14.6 Laser Toolhead safety rules

Instructions for preparing the workplace and how to safely operate the Laser Toolhead on Zmorph Fab. The Laser Toolhead supplied with the Zmorph Fab machine is a 2.8 Watts class 4 laser with emitted wavelength of 450nm.

These types of lasers are extremely dangerous, they emit visible or invisible radiation and they cause irradiation greater than allowed. Diffuse radiation is dangerous to eyes and skin. Potential hazards are materials evaporated from the surfaces of illuminated objects. Depending on the material used, toxic fumes may affect the user's respiratory tract and eyes.

### Workstation

- Avoid using any reflective surface in the room in which the laser is used (eg mirrors, equipment with shiny metal-chromed, nickel-plated, aluminized - or glass parts),
- It is necessary to secure the room in which the Zmorph machine with Laser Toolhead is located and not working before an unprofessional start-up (the key to the room should only be held by a person authorized to operate the laser),
- It is necessary to mark the entrance door to the room where the device with the attached Laser Toolhead is used with an appropriate laser radiation warning sign,

# Laser workflow

---

## Laser beams warning sign



- It is necessary to mark the entrance door to the room where the device with the attached Laser Toolhead is used with the appropriate sign to wear protective goggles,

## Eye protection required, wear protective goggles



- Place in a visible place next to the laser workplace a label with the words 'visible and invisible laser radiation, protect the eyes and skin from direct or diffuse radiation',
- Provide personnel and bystanders in the room where the laser device works with protective eye shields (glasses, safety goggles) appropriate to the type of laser device,
- The appropriate safety goggles are those which, in a visible place (e.g. on the outside of the frame) have the required markings (e.g. in the form O.D. = 3 for wavelengths of 660 nm or L = 3 for wavelengths of 820 nm). The value of 7 for the O.D. informs that such glasses weaken the power of radiation falling on them 10000000 times. For example, for a 1 W laser with such eyepieces, 0.1 uW of power will reach the eye and it is a radiation level that is completely safe for the human eye,
- Provide personnel and bystanders staying in the room where the laser device works with mouth and nose masks equipped with a filter absorbing smoke particles (FFP3),
- Electrical installation of the Zmorph Fab machine requires connecting it to a grounded socket,
- Provide a room in which a working Zmorph machine with Laser Toolhead is installed in a valid powder extinguisher, it should be located in an accessible place and marked with appropriate markings,
- When installing the Zmorph machine with Laser Toolhead in a room where smoke detectors are installed, make sure that they do not cause false alarms,
- The room in which the Zmorph machine with the Laser Toolhead machine is located must be well ventilated, even with the HEPA and carbon filtration system hazardous vapors may escape from the machine.

# Laser workflow

---

## Safety instructions for handling Laser Toolhead on Zmorph Fab

### General information.

- The Zmorph Fab machine with Laser Toolhead mounted should be used in a separate room with out the possibility of outsiders getting in,
- Regardless of the laser class, it is forbidden to look at the laser beam (i.e. to look into the opening of the laser from which the beam is emitted); this also applies to the reflected beam,
- Using the machine by unqualified personnel may lead to damage to health and/or damage to the machine. Zmorph Fab machine and Laser Toolhead are not toys and can't be used by children without adult supervision,
- If you notice any abnormalities in the operation of the machine, stop the process immediately with the reset button (red button on the right side on the front panel of the machine) and contact the Zmorph Technical Support,
- Do not use a defective machine under the threat of losing the warranty,
- When using the Zmorph Fab machine with Laser Toolhead, both the staff and the by-standers (if any around) must always wear safety goggles, failing to comply with this recommendation may result in damage or loss of sight,
- Never open any covers under which the machine components are hidden with the power supply connected. If it is necessary to repair or inspect components, please contact the official Zmorph Technical Support,
- Before starting work on the machine with Laser Toolhead, make sure that the machine's surroundings (work room) is closed and that there is no possibility of unauthorized access without proper eye protection.

### Safety at work with Laser.

- Any exposure to laser emission may cause physical burns or damage to your eyesight. It is extremely important to use the device in a safe manner and in accordance with the instructions,
- The Zmorph Fab machine on which the Laser Toolhead is mounted and working can not be left unattended,
- A fire extinguisher with valid approval should always be located as close as possible to the machine to which the laser is connected,
- The use and maintenance of the machine must always be carried out in a manner consistent with the description in the manual,
- Make sure that the room ventilation works correctly,
- Install the workpieces and tools in the correct places in a safe manner. Avoid colliding the workpiece with the machine. Otherwise, the machine may be damaged,

# Laser workflow

---

- Check that there are no obstacles in the work area before starting work,
- During the change of the workpiece, stop all operations,
- Do not touch electrical parts with wet hands,
- Do not place your hands in the working area during processing.

## Warning signs



Prevent eye exposure: Class 4 visible-beam lasers are high-powered. A Class 4 laser can cause a significant eye injury if the beam, whether direct or reflected, enters the eye.



Avoid skin exposure: Avoid exposure to skin and sensitive materials. A Class 4 laser can burn skin and materials, especially dark and/or lightweight materials at close range.



Attention! Danger: General warning sign. W001, according to PN-EN ISO 7010.



Laser beam warning: Warning sign used to warn of danger presented by laser beams. W004, according to PN-EN ISO 7010.

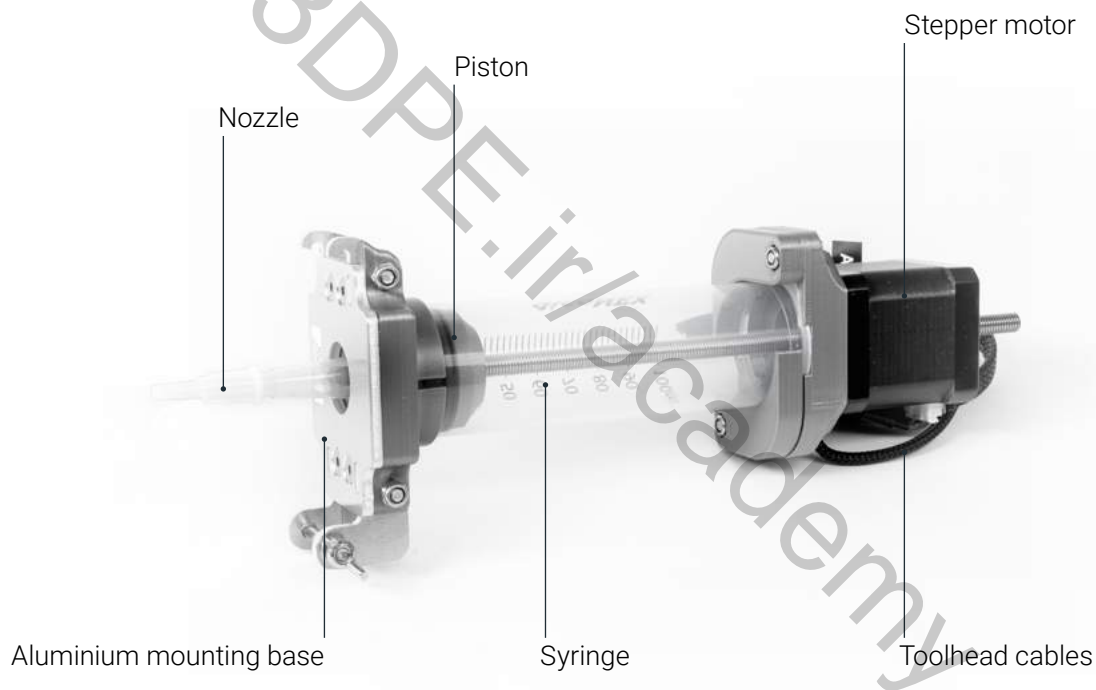
# Thick paste extruding workflow

## 15. Thick Paste Extruding

### 15.1 Thick Paste Extruder Toolhead

Thick Paste Extruder Toolhead is a toolhead usable in 2D and 3D printing. It consists of a stepper motor that pushes material in syringe through nozzle.

Main elements of Thick Paste Extruder Toolhead:



#### Specification:

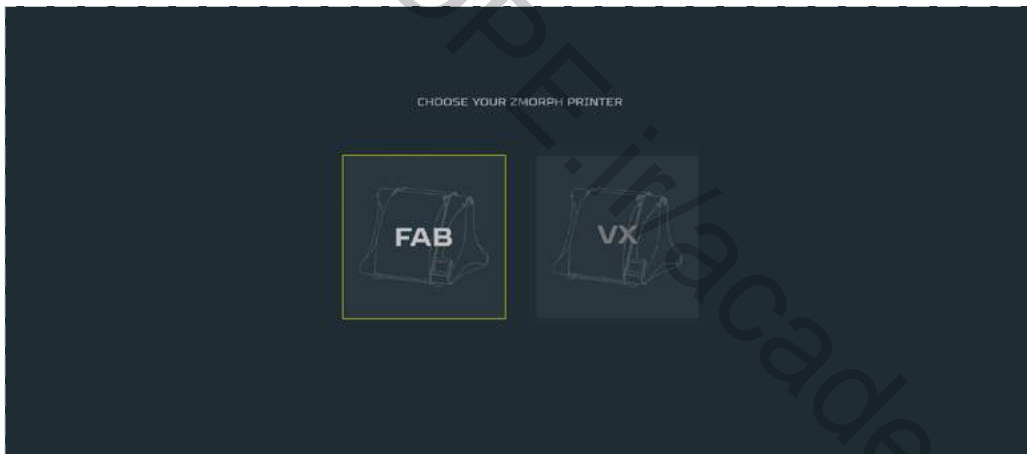
- Construction: 3 mm aluminum base with ABS printed parts
- Nozzle: 2 mm, 4 mm
- Motor: Nema 17 stepper motor
- Default work speed: 10 mm/s (depends on the material)
- Extrusion: Direct Drive
- Work area: up to 250 x 235 x 165 mm (without covers)
- Recommended printing resolution: 2 mm layer height (2000 microns)
- Supported printing resolution: 0.5 - 4 mm layer height (500 - 4000 microns)
- Material capacity: 100 ml
- Extruder dimensions: 90 x 55 x 271 - 380 mm

# Thick paste extruding workflow

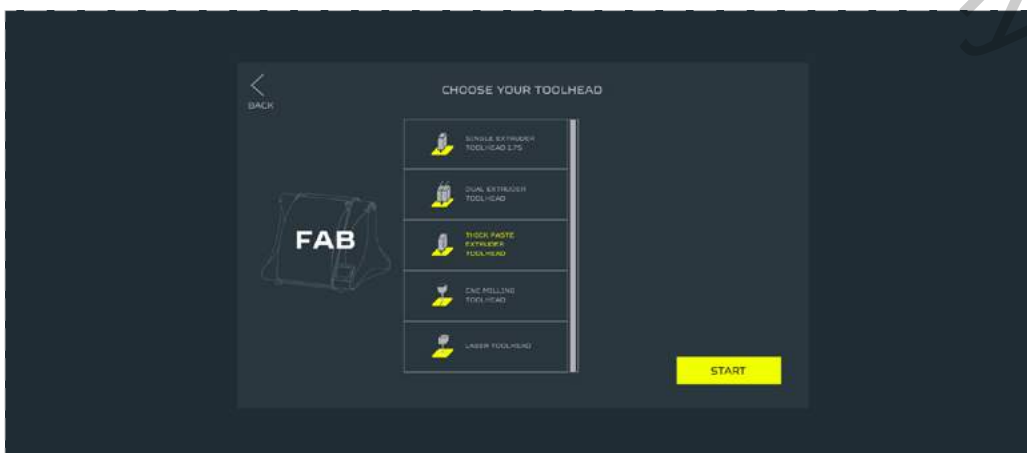
## 15.2 Materials

Thick Paste Extruder Toolhead has a wide potential for experimental applications in art projects, material research, and custom cake decorations. Its simple construction also makes it safe for educational purposes and working with children. The toolhead can print using medium and dense masses like ceramics, Nutella, chocolate and sugar toppings, and cookie dough.

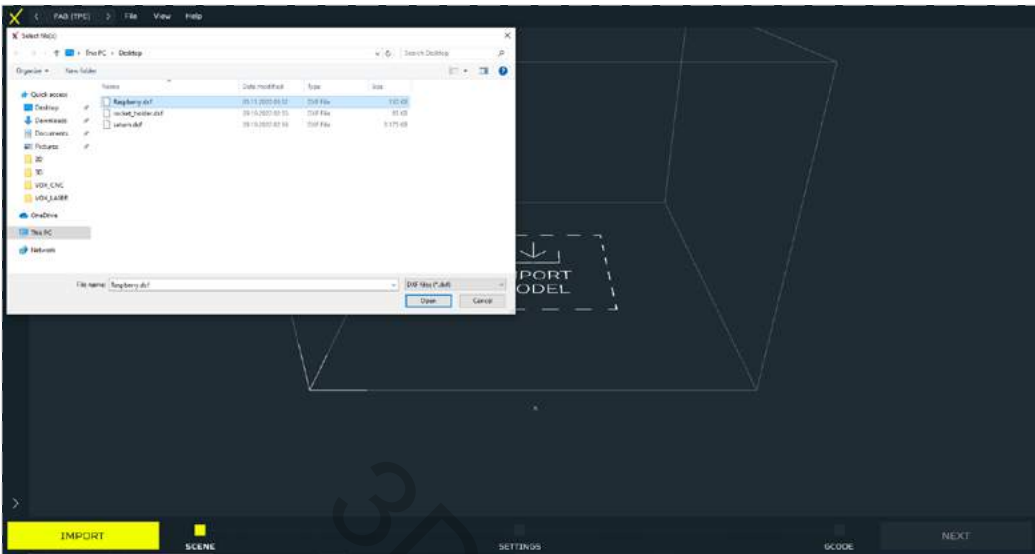
## 15.3 Thick Paste file preparation



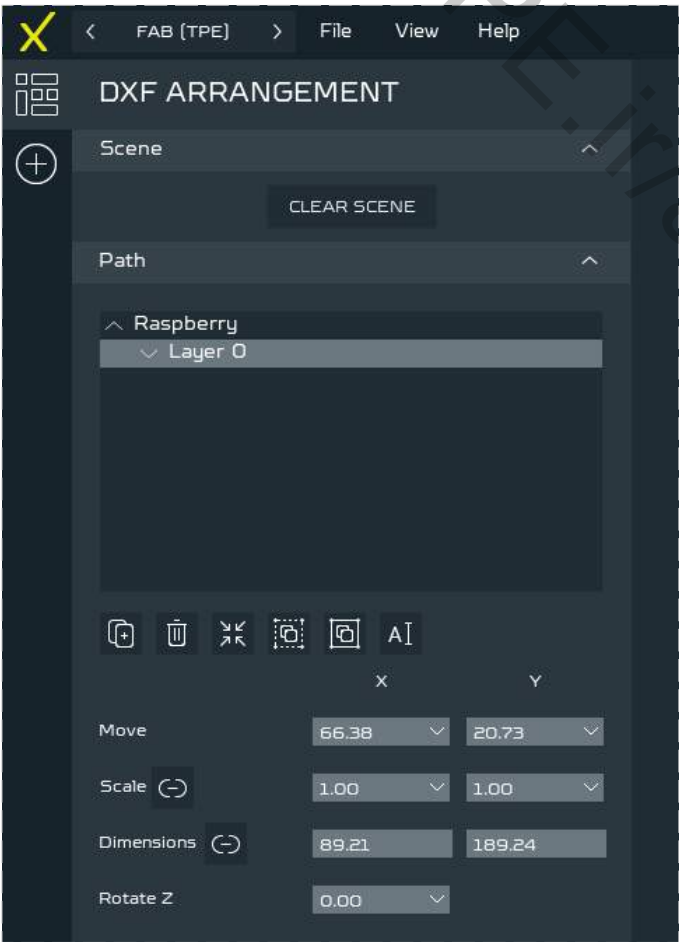
Open Voxelizer software and choose Zmorph Fab machine, Thick paste extruder Toolhead and click the START button.



# Thick paste extruding workflow



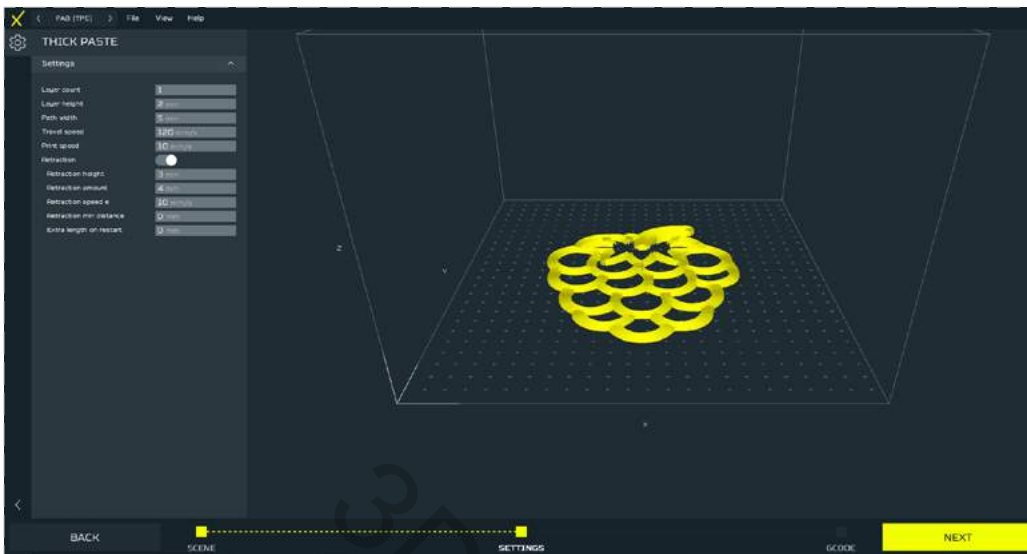
Import a .DXF file type.



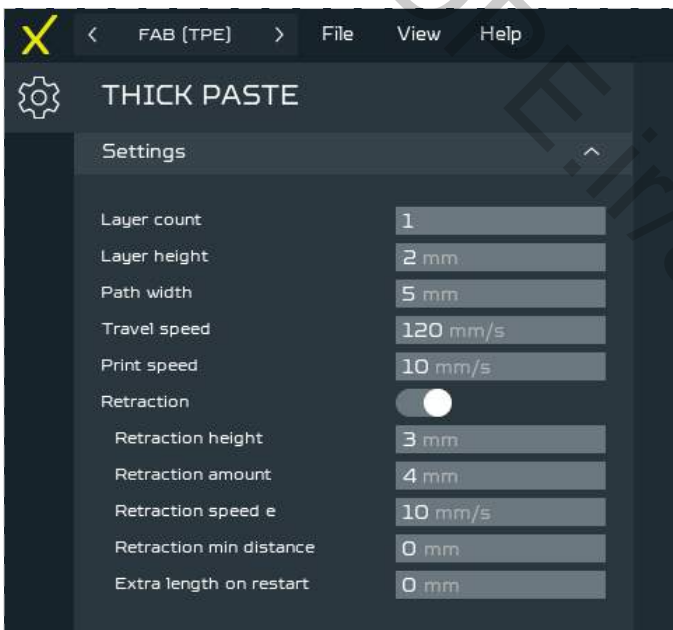
To be able to freely move, scale and rotate the model on the table preview go to DXF ARRANGEMENT menu.



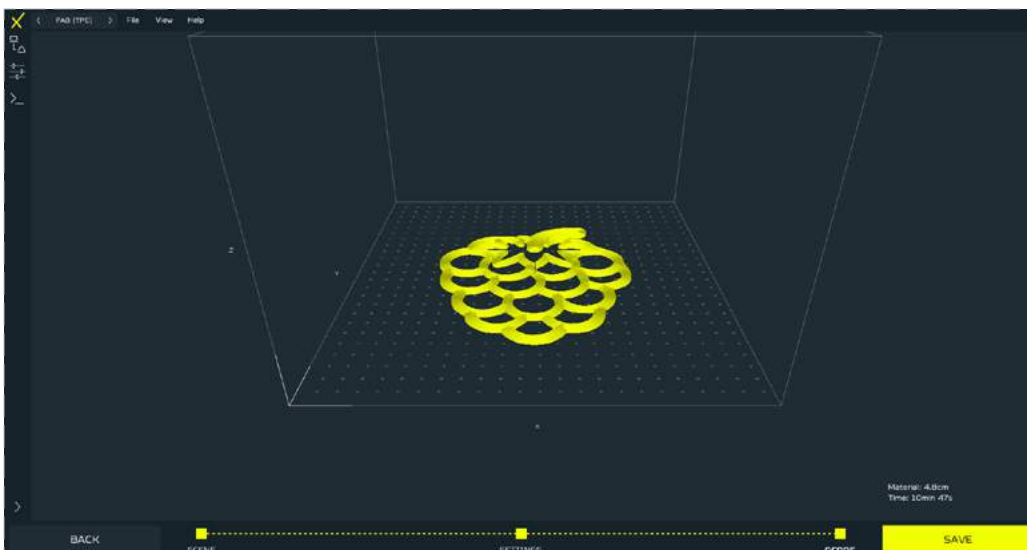
# Thick paste extruding workflow



Click NEXT when ready. You will be automatically moved to the SETTINGS tab.



Set operation parameters according to paste being used and click NEXT and wait for your G-code to be generated.



Now you can check the generated G-code and save it.

# Thick paste extruding workflow

## 15.4 Material application



Prepare the Thick Paste Extruder.



Unlock the syringe blockade.



Pull the piston out from the syringe.



Manually move the piston to the starting position.



Fill the syringe with the prepared material.



Push the piston inside the syringe and lock the syringe blockade.



Put the Thick Paste toolhead on the X-carriage mount.



Screw tight the front screw.

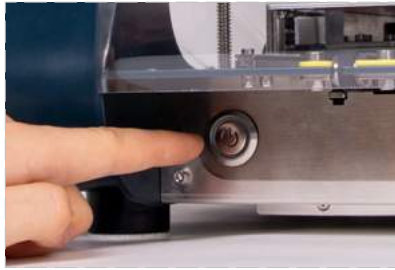


Connect the 'LEFT' connector to the Left socket on the machine frame.

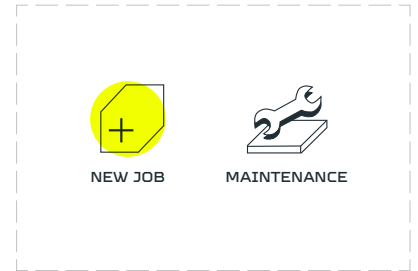
# Thick paste extruding workflow



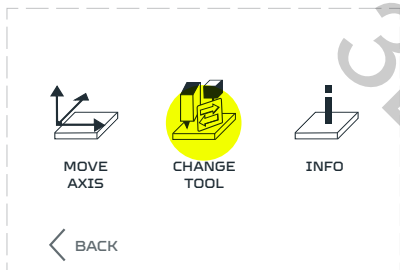
Connect the 'A' cable to the A cable from X-carriage.



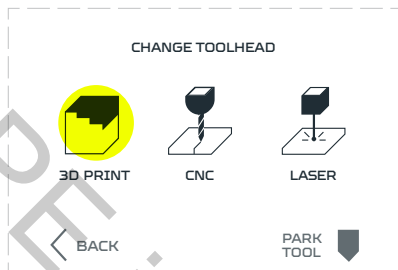
Turn on the machine.



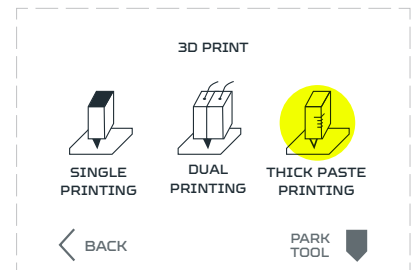
Enter the 'MAINTENANCE' menu.



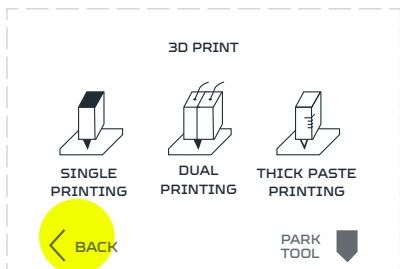
Go to the 'CHANGE TOOL' option.



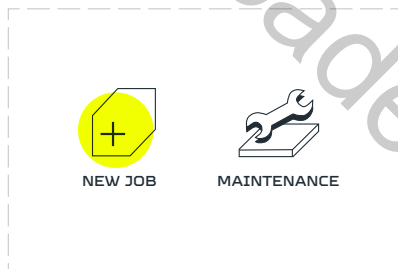
Go to the '3D PRINTING'.



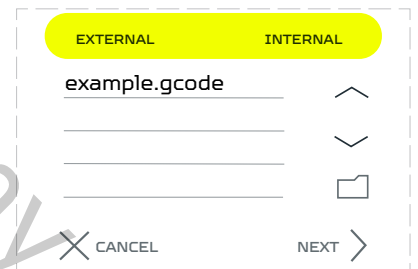
Choose 'THICK PASTE PRINTING' option.



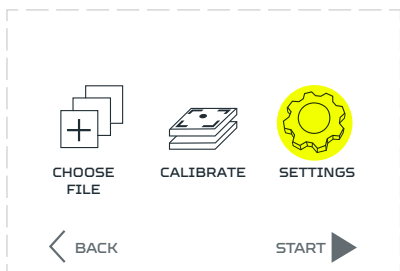
Go back to the 'MAIN MENU' screen.



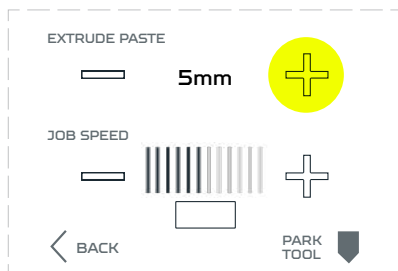
Enter the 'NEW JOB'.



Press the 'NEXT' button.



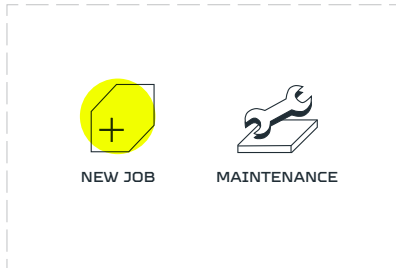
Go to the 'SETTINGS' option.



Push the 'EXTRUDE/EXTRACT PASTE' button until the paste flow from the syringe.

# Thick paste extruding workflow

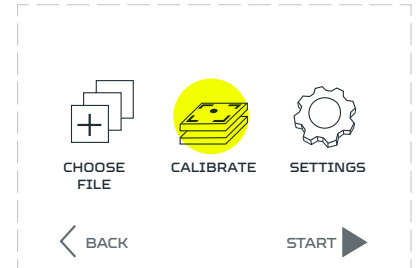
## 15.5 Thick Paste file starting (with calibration)



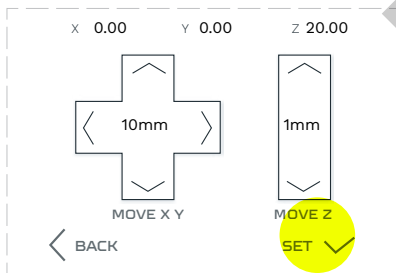
Enter the 'NEW JOB'.



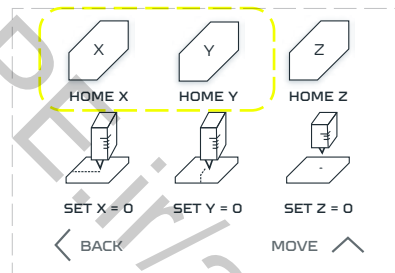
Choose your prepared file and press 'NEXT' button.



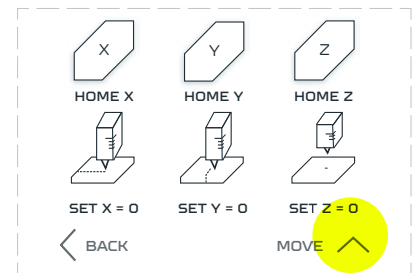
Go to the 'CALIBRATE' option.



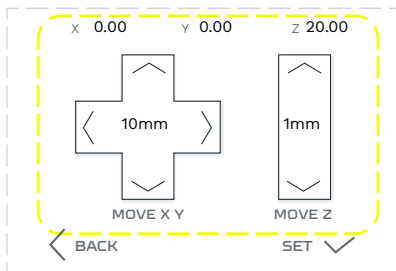
Press the 'SET' button.



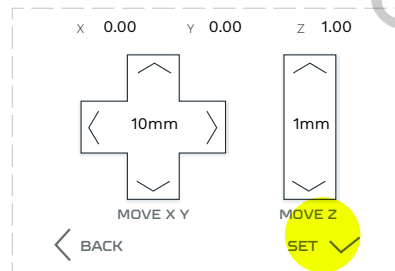
Press the 'HOME X' and 'HOME Y' buttons. **Warning!** Do not press the 'HOME Z' button.



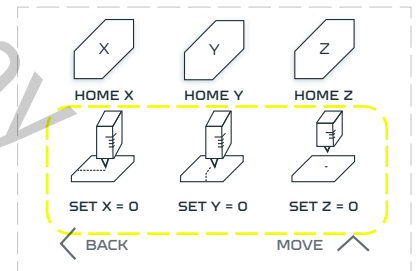
Go back to the 'MOVE' page.



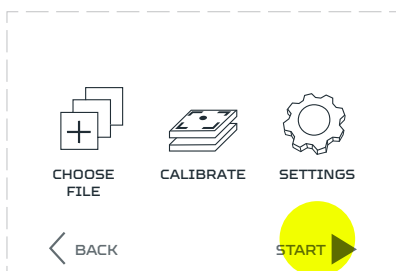
Use the 'MOVE X, Y, Z' buttons to maneuver the Thick Paste syringe to be 1mm above the front left corner of the table.



Return to the 'SET' page.



Press all the 'SET x, y, z=0' button to define the local zero points.



Go back to the main menu and choose 'START'. Your machine will start working.

# Thick paste extruding workflow

---

## 15.6 Thick Paste Extruder Toolhead safety rules

Thick Paste Extruder Toolhead enables 2D and 3D printing of dense masses which are extruded at high pressure through an exchangeable nozzle. During the work remember to always follow safety restrictions:

- Objects printed with the Thick Paste Extruder Toolhead are not certified as edible.
- Do not inject any hard and solid materials inside of the Thick Paste Extruder Toolhead syringe. It may damage the Thick Paste Extruder Toolhead.
- Do not place your hands in the working area during Thick Paste Extruder Toolhead work.
- Install the workpieces and tools in the correct places in a safe manner. Avoid colliding with the workpiece with the machine and the Thick Paste. Otherwise, it may be damaged.
- Check that there are no obstacles in the work area before starting work.

3DPE.ir/academy

## 16. Machine maintenance and operation

### 16.1 Basic maintenance

Maintenance work should be carried out regularly to keep the machine in good condition and to achieve a high-quality printed object every time. Some parts of the machine require maintenance before each job and some only periodically. Maintenance is not complicated or time-consuming. During the maintenance process, the machine should be cooled down (preheat only if necessary) and disconnected from the power source (turn on only if necessary).

It is recommended to equip yourself with additional protective equipment such as thermal insulation gloves and safety goggles. The machine is supplied with a basic set of tools for maintenance and service.

The following tables summarize the maintenance and repair guidelines for the main components of the machine, the tables are divided by place of inspection, necessary tools, and their frequency.

# Maintenance and operation

## 16.2 General procedures

To Do	Tools	Frequency	Solution
Cleaning the work area from model residues and chips.	<ul style="list-style-type: none"> <li>■ vacuum cleaner,</li> <li>■ fast evaporating cleaners (containing alcohol)</li> <li>■ compressed air</li> </ul>	Before each job	For the safety of the machine, the vacuum cleaner pipe should not be made of metal or it should have a plastic cap. When the worktable is removed from the machine, using the vacuum cleaner pipe with a plastic cap, remove all bits of material and residues from the work area. The side covers can be disassembled for better access. If there is not a lot of dirt, disassemble all covers and use compressed air to blow out the bits of material.
Cleaning the interior of the machine and the power supply from dust	<ul style="list-style-type: none"> <li>■ compressed air</li> </ul>	Every 10,000 working hours	To clean the machine electronics from dust, first, disconnect it from the power supply and lay it on its side. Be careful not to damage it. The mainboard and its cooling fan can be blown with spray air through the holes in the bottom cover. The power supply electronics can be blown through the ventilation holes in the power supply case.
Changing the filter		Every 1000 working hours or each 6 months	

# Maintenance and operation

## 16.3 Worktable procedures

To Do	Tools	Frequency	Solution
Cleaning the surface of the glass worktable	<ul style="list-style-type: none"> <li>■ dry cloth</li> <li>■ fast evaporating cleaners (containing alcohol)</li> <li>■ paper towel</li> <li>■ spatula</li> </ul>	Every couple of prints	To remove the old adhesive from the surface of the worktable use a piece of damp cloth and a cleaning agent. The worktable should be cold. If there are any plastic parts on the table, remove them with a spatula.
Checking the surface of the glass worktable for any damage		Before each job	The surface of the glass sheet should be inspected to ensure there is no chipping or cracking.
Calibrating (leveling) the worktable		After changing the toolhead	Auto calibration or manual calibration must be performed each time the toolhead or nozzle is changed in the toolhead.



# Maintenance and operation

## 16.4 3D printing toolhead procedures

To Do	Tools	Frequency	Solution
Cleaning the nozzle surface from dirt and material residues	<ul style="list-style-type: none"> <li>■ tweezers</li> <li>■ wire brush</li> </ul>	Before each job	Remove any residual material from the heated nozzle with tweezers. If the leftover material cannot be removed with tweezers, a wire brush can also be used.
Nozzle (interior) cleaning	<ul style="list-style-type: none"> <li>■ drill 0.3mm or 0.4mm</li> </ul>	After each material spool	After using the whole spool of material, burnt material may begin to settle on the internal walls of the nozzle. To avoid clogging clean the nozzle with a drill pushing it inside the nozzle from below in a few moves. Then, pass through the nozzle a few centimeters of material.
Nozzle change	<ul style="list-style-type: none"> <li>■ wrench 10</li> <li>■ adjustable wrench 150</li> </ul>		The nozzle must be warmed up to 200°C, after heating it up, switch off the machine and remove the toolhead from the X carriage. The adjustable wrench must be placed on the heating block just above the thermistor (heat sensor) and tightened, with the use of a flat wrench (10) unscrew the nozzle from the heating block taking care not to damage the heating barrier.
PTFE tube change	<ul style="list-style-type: none"> <li>■ wrench 10</li> <li>■ adjustable wrench 150</li> <li>■ Wood screw or drywall screw</li> </ul>	Every 750 working hours or after 4kg of material	The nozzle must be warmed up to 200°C, after heating it up, switch off the machine and remove the toolhead from the X carriage. The adjustable wrench must be placed on the heating block just above the thermistor (heat sensor) and tightened, with the use of a flat wrench (10) unscrew the nozzle from the heating block taking care not to damage the heating barrier. Remove the old PTFE tube using the Wood screw by screwing it into the tube. Replace the old PTFE tube with a new (2/4mm) one. You can use the old tube to cut a new one at the same length. The new tube must be the same length (0.1 mm longer than the thermal barrier is acceptable), otherwise the material might leak out of the heating block.

# Maintenance and operation

## 16.5 X,Y,Z axes procedures

To Do	Tools	Frequency	Solution
Checking the friction on the X and Y axis carriages		Every 1500 working hours	This is done while the machine is switched off. Manually move the toolhead left/right and the worktable move forwards/backwards to determine if something is hindering their movement.
Cleaning the X and Z axis rails from dirt and lubricating them	<ul style="list-style-type: none"> <li>■ lubricating oil</li> <li>■ PTFE grease</li> <li>■ dry cloth</li> <li>■ paper towel</li> </ul>	Every 1500 working hours	This is done while the machine is switched off. Apply some grease to a dry cloth or paper towel and spread it on the X and Z-axis rods. For easier access to the Z-axis guides, the side covers can be removed. Check the rods for dirt, remove it with a dry cloth or mechanically. Manually move the toolhead left/right to spread the grease.
Cleaning the Y axis rails from dirt and lubricating them	<ul style="list-style-type: none"> <li>■ lubricating oil</li> <li>■ PTFE grease</li> <li>■ dry cloth</li> <li>■ paper towel</li> </ul>	Every 1500 working hours	This is done while the machine is switched off. Apply some grease to a dry cloth or paper towel and spread it on Y-axis rails. Manually move the worktable forwards/backwards to spread the grease.
Checking the tension of the timing belts of the X and Y axis	<ul style="list-style-type: none"> <li>■ adjustable</li> <li>■ wrench 150</li> <li>■ Allen key 2,5 mm</li> </ul>	Every 1500 working hours	In the case of loose timing belts, tighten the tension bar screws. For the X-axis belts, evenly tighten the two screws located on the right-hand Z-axis lift. In the case of the Y-axis belts, first, loosen the 4 screws securing the tension bar at the front of the machine. Then, using a tension wrench or simply a M4 bolt with a nut, tighten the Y-axis straps and tighten the tension bar screws.
Checking the mounting screws in the timing pulley for the X and Y axis	<ul style="list-style-type: none"> <li>■ Allen key 2mm</li> </ul>		Tighten all mounting screws in the timing pulley on the X and Y axes.
Lubrication the Z axis	<ul style="list-style-type: none"> <li>■ Lubrication the Z axis</li> </ul>	Every 1500 working hours	Apply the grease directly to the Z-axis screws just above the Z-axis lifts, and then use the LCD interface to move the Z-axis up and down to distribute the grease through the screws.

- Lack of proper axis maintenance may have an impact on the printed model, the model quality might drop or the axis may get stuck (axis blockage). Regular cleaning and proper lubrication of the axis can bring benefits in the form of saved material or time spent preparing the device for printing.
- Failure to clean the machine may result in unwanted damage or malfunction of the drive components.

## 17. Spare parts

List of consumable parts:

- Teflon tube (PTFE) 2mm/4mm - Single Extruder 1.75 mm and Dual Extruder Toolhead 1.75 toolheads,
- Teflon tube (PTFE) 3mm/5 mm - Single Extruder 3.00 mm toolhead,
- Knurled roller - Single Extruder 1.75 mm toolhead,
- Knurled roller - Dual Extruder Toolhead Toolhead Toolhead 1.75 toolhead,
- Knurled roller - Single Extruder 3.00 mm toolhead,
- Nozzle 0.2, 0.3, 0.4 [mm] - Single Extruder 1.75 mm toolhead,
- Nozzle 0.3, 0.4 [mm] - Single Extruder 3.00 mm toolhead,
- Nozzle 0.4 [mm] - Dual Extruder Toolhead,
- Borosilicate glass - Worktable for 3D printing (heated bed),
- HEPA Filter - cartridge for the filtration system.

In case of physical damage or failure one of the machine parts, do not install spare parts other than the ones recommended by the Manufacturer. Please contact Technical Support to receive the list of available spare parts or their replacements.

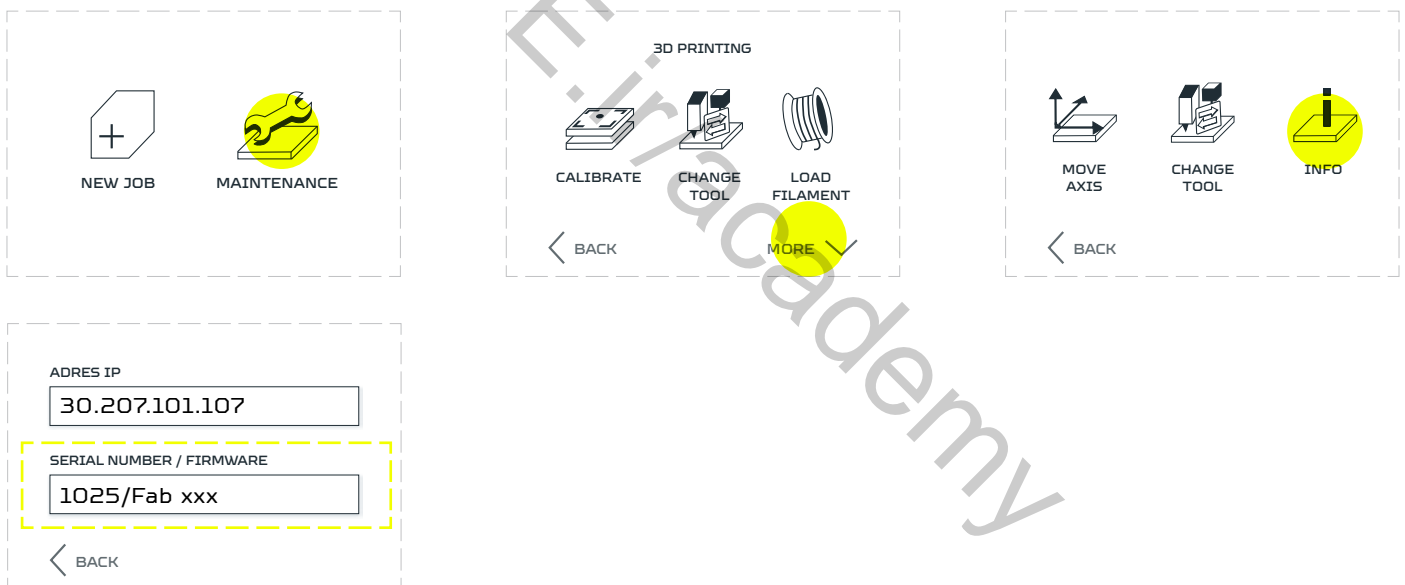
# Firmware upgrades

## 18. Firmware upgrades

### 18.1 General informations

Once in a while Zmorph releases a firmware update for Fab model. The current firmware-version is available to download at the Zmorph Knowledge Base: [bit.ly/Zmorph\\_Fab\\_Firmware](https://bit.ly/Zmorph_Fab_Firmware)

To check the firmware version of the machine on the main screen choose Maintenance -> More -> Info. Version is displayed in lower box after the slash symbol (/) and contains three digits separated by dots. For example 1025/FAB xxx means that firmware running on the machines is versioned xxx.



The information about new firmware release is always published at our website, social media, and via newsletter so be sure to follow these.

Firmware update is available in several language versions (German, English, French, Kazakh, Polish, Spanish). The update pack is an archive file with .zip extension.

File naming convention is as follows: FAB\_Firmware\_FIRMWARE\_VERSION\_NUMBER\_ LANGUAGE.zip e.g. FAB\_Firmware\_1\_0\_1\_German means that it's firmware 1.0.1 with german language.

The archive contains folder named the same as chosen language, inside there is a LCD folder and file named FIRMWARE.bin.

# Firmware upgrades

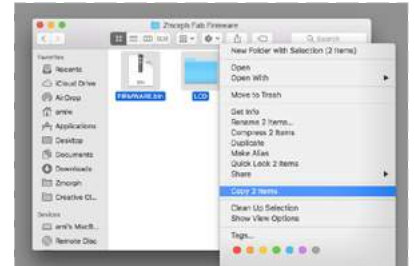
## 18.2 Updating firmware



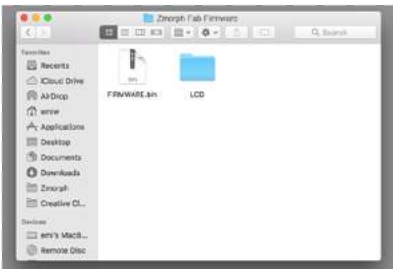
Prepare an SD card.



Download the newest firmware archive file with .zip extension from Zmorph Knowledge Base.



Extract files from from downloaded archive.



From the extracted folder copy the LCD folder and FIRMWARE.bin and place it in the main directory of the SD card.



Make sure that machine is powered on. If not, turn it on by pushing the power button.



Insert the SD card into the slot located next to the LCD screen.

**Printer update detected.  
It will start in 30 seconds  
Do You want to proceed**

NO

YES

Message about firmware update detection should appear and the 30 seconds countdown should start. After this time the update will begin automatically. Choose 'Yes' to proceed and skip countdown.

**Please wait for the update  
DON'T TURN OFF  
THE PRINTER  
DON'T REMOVE  
SD CARD**

The machine will start updating the firmware. You must not remove the SD card, turn off or reset the printer during this process.

**Update completed!  
Printer will be restarted**

After update finishes, the machine should restart itself.

# Firmware upgrades

---

LCD screen update detected.  
It will start in 30 seconds  
Do You want to proceed

Message about firmware update detection should appear and the 30 seconds countdown should start. After this time the update will begin automatically. Choose 'Yes' to proceed and skip countdown.

Please wait  
for the printer update.

It may take  
up to 60 minutes

The machine will start updating the LCD screens. You must not remove the SD card, turn off or reset the printer during this process. This process may take up to 60 minutes, the progress bar will inform you about update status.

Update completed!  
Please restart the printer

After the successful update the proper message will be displayed. Restart the printer. The machine is fully updated.

## 19. Help and support

### 19.1 Support request

In concern for Zmorph Fab customers, our company provides technical support to solve the problems. In case of problems with the machine or toolhead, review the troubleshooting suggestions in this instruction. If the information provided with the instruction is insufficient you should contact your local supplier from which you bought the machine or contact directly Zmorph Technical Support by submitting the request on the website:

[support.Zmorph3d.com/hc/en-us/requests/new](https://support.Zmorph3d.com/hc/en-us/requests/new)

Before you submit the request please prepare all of the required information:

- Machine serial number.
- Firmware version of the machine.
- Error name if it occur in front LCD screen.
- Video or photo which shows the problem is not required but it will help us to solve your problem faster.

If you have a print-quality problem, please provide information like: type of material, material producent, used toolhead, attached .gcode file, slicer you used for preparing the .gcode file.

## 19.2 Troubleshooting

Symptom	Cause	Solution
Filament is not going through the nozzle.	<ul style="list-style-type: none"> <li>■ The material is tangled.</li> <li>■ The material is defective.</li> <li>■ The nozzle is clogged.</li> <li>■ The material is blocked inside the extruder.</li> </ul>	<ul style="list-style-type: none"> <li>■ Check if the material is not tangled and the spool is properly installed.</li> <li>■ Check if the material is properly inserted inside the tool.</li> <li>■ Check if the used material is not defective (there are no bubbles, the diameter is constant etc.).</li> <li>■ Check if the end of the material is cut at a right angle</li> <li>■ Contact with Technical Support.</li> </ul>
The print doesn't stick to the worktable (warping) The print is warping.	<ul style="list-style-type: none"> <li>■ Work table is not clean.</li> <li>■ There is no adhesive.</li> <li>■ First layer is too high above the work table.</li> <li>■ The temperature of the work table is too low.</li> </ul>	<ul style="list-style-type: none"> <li>■ Check if the work table cleaned.</li> <li>■ Make sure there is adhesive agent applied.</li> <li>■ Perform new autocalibration.</li> <li>■ Restore factory default, and repeat the calibration process.</li> <li>■ Use 1-point manual calibration to set proper Z0 value.</li> <li>■ Make sure that the work table has a proper temperature.</li> </ul>
The print is cracked.	<ul style="list-style-type: none"> <li>■ No covers attached.</li> <li>■ Improper print temperature.</li> </ul>	<ul style="list-style-type: none"> <li>■ Make sure that covers are attached on the machine.</li> <li>■ Make sure the print temperature is right according to the material manufacturer's specifications.</li> <li>■ Make sure that the .gcode file is designed correctly.</li> </ul>
The print is melted.	<ul style="list-style-type: none"> <li>■ The print temperature is too high.</li> <li>■ There is no cooling fan attached.</li> </ul>	<ul style="list-style-type: none"> <li>■ Make sure that the cooling fan is attached.</li> <li>■ Make sure the print temperature is right according to the material manufacturer's specifications.</li> <li>■ Make sure that the .gcode file is designed correctly.</li> <li>■ Check if the thermistor is correctly installed inside the heating block.</li> </ul>
No connection via USB.	<ul style="list-style-type: none"> <li>■ PC is not detecting the machine.</li> </ul>	<ul style="list-style-type: none"> <li>■ Check the USB cable with other device.</li> <li>■ Push the red reset button in front of the machine.</li> <li>■ Check for drivers update.</li> </ul>



# Help and support

In case when an error occurs while the machine is working, an error message will be displayed on the machine LCD screen. The following table explains the error meanings, provide probable cause of the error and suggested solutions.

Error message	Cause	Solution
External SD Card unmounted.	<ul style="list-style-type: none"> <li>■ SD card has lost the connection.</li> <li>■ No reading from external SD Card.</li> </ul>	<ul style="list-style-type: none"> <li>■ Reconnect the SD Card.</li> <li>■ Format external SD Card (FAT 32).</li> <li>■ Check the connection with other SD Card.</li> <li>■ Contact with Technical Support.</li> </ul>
TouchProbe cable not found. Please, connect B cable.	<ul style="list-style-type: none"> <li>■ The B cable is not connected.</li> <li>■ The B cable is not detected.</li> </ul>	<ul style="list-style-type: none"> <li>■ Check the connection of the B cable, reconnect the B cable.</li> <li>■ Contact with Technical Support.</li> </ul>
TouchProbe cable not found. Please, connect B cable.	<ul style="list-style-type: none"> <li>■ The A cable is not connected.</li> <li>■ The Tensometer is not detected.</li> </ul>	<ul style="list-style-type: none"> <li>■ Check the connection of the A cable, reconnect the A cable.</li> <li>■ Connect another extruder to check the connection.</li> <li>■ Contact with Technical Support.</li> </ul>
Internal electronics is too hot. Please check the fan in the bottom of the machine.	<ul style="list-style-type: none"> <li>■ Internal electronic has too high temperature, bottom fan probably not working.</li> </ul>	<ul style="list-style-type: none"> <li>■ Check the fan on the bottom of the machine.</li> <li>■ If fan is not working please, contact with Technical Support.</li> </ul>
Heating failure. Please, restart the machine.	<ul style="list-style-type: none"> <li>■ Error of the thermistor temperature reading.</li> </ul>	<ul style="list-style-type: none"> <li>■ Contact with Technical Support.</li> <li>■ Check is the thermistor has no short circuit with the machine frame.</li> <li>■ Check the current temperature reading.</li> </ul>
Axes blockage.	<ul style="list-style-type: none"> <li>■ One of the axes got blocked by rest of the material.</li> <li>■ Toolhead hit the print.</li> <li>■ CNC mill stuck in milled material.</li> </ul>	<ul style="list-style-type: none"> <li>■ Reset the machine.</li> <li>■ Remove the elements which cause the blockade.</li> <li>■ Check the X and Y axis work by hand.</li> <li>■ Make sure that nothing is blocking the axes before new job.</li> </ul>

# Help and support

---

Calibration result inaccurate.

- Inaccurate result of the auto calibration.
- Check if the work table is aligned correctly.
- Check if the X-axis is leveled correctly.
- Check the position of the Z-axis sensor.
- Restore the machine to factory default.
- Contact with Technical Support

Config file does not exist.

- Config file is missing.
- No reading from internal SD Card.
- Internal uSD Card is unplugged or damaged.
- Check the uSD Card content.
- Check the uSD Card connection to mainboard.
- Visit knowledge base to download new config file.
- Contact with Technical Support.

Config file corrupted.

- Config file is corrupted.
- Visit knowledge base to download new config file.
- Contact with Technical Support.

In case of inappropriate machine behavior, take every precaution and disconnect the machine from the power source and immediately contact with Technical Support.

[support.zmorph3d.com/hc/en-us/requests/new](https://support.zmorph3d.com/hc/en-us/requests/new)

## 19.3 Handy resources

- **Zmorph Academy** [academy.Zmorph3d.com/](https://academy.Zmorph3d.com/)

Zmorph Academy is a comprehensive online platform for Zmorph Fab users. With almost 100 courses full of videos, pictures, and exercises, Zmorph Academy is designed to create and build skills with 3D printing, CNC milling, and , engraving.

After finishing, the user will be able to make custom working PCBs and other complex projects.

- **Zmorph Knowledge Base** [support.Zmorph3d.com/](https://support.Zmorph3d.com/)

Knowledge Base gathers all technical wisdom of Zmorph products, like information about printers maintenance and quick tips on Fabrication methods.

- **Voxelizer Software** [voxelizer.com/](https://voxelizer.com/)

Zmorph's original Voxelizer software is the intelligence behind the machine. It allows you to control all Fabrication methods of Zmorph Fab and gives you access to the most advanced 3D printing capabilities.

- **Zmorph Blog** [blog.Zmorph3d.com](https://blog.Zmorph3d.com)

Zmorph Blog presents news and stories from the Zmorph world: articles on all fabrication methods, use cases, special offers and many others.

- **Zmorph Materials Library** [zmorph3d.com/product/materials](https://zmorph3d.com/product/materials)

Zmorph Materials Library is an essential resource that gives a comprehensive outlook on a wide range of manufacturing materials supported by Zmorph Fab Multitool 3D Printers. The document provides detailed information about almost 50 materials including easy-to-read data, technical information, working parameters, features, and applications.