



# Operating instructions

## Original Desktop Filament Extruder MK3S and MK3S+ by ARTME 3D®

Version 1.2

CE

**Thank you for purchasing the extruder kit from ARTME 3D®**

**The assembly instructions and the required 3D printer files for your kit can be found here:**

[www.artme-3d.de/produkte](http://www.artme-3d.de/produkte)

**If you have any questions or problems with our products, you will find help and contact options here:**

[www.artme-3d.de/contact](http://www.artme-3d.de/contact)

**If you can understand these instructions better in another language, you can find these operating instructions in other languages here:**

[www.artme-3d.de/produkte](http://www.artme-3d.de/produkte)

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The information in this manual is subject to change without notice. The latest version can be found at [www.artme-3d.de/produkte](http://www.artme-3d.de/produkte). The images in this manual are for illustrative purposes only and are not to scale.

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# 00-Quick start guide

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1. be sure to read the important notes and safety instructions in chapter 02.
2. place the extruder on a stable and level surface in a dry and ventilated place.
3. switch on the extruder by connecting the power supply unit to a power socket.
4. carry out the settings in chapter 05.
5. Ensure that the material to be processed meets the requirements in chapter 06.
6. learn the preparation process in chapters 07 to 08.
7. start filament production as described in chapters 09 to 10.

## 01 Installation instructions and user licenses

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### 01.1 Assembly instructions for your extruder kit:

How to assemble the Original Desktop Filament Extruder MK3 kit is described in an online knowledge database at: [www.artme-3d.de/produkte](http://www.artme-3d.de/produkte)

Select your language and your product and you will find the assembly instructions.

### 01.2 Using the instructions and 3D printer files:

All parts of the online manual and the 3D printable components are published under a **CC BY-SA license**, which you may use in the following manner:

- Using the documentation and 3D printer files.
- Modify the documentation and 3D printer files.
- Passing on the documentation and 3D printer files.

**This use is subject to the following conditions:**

- State my name: David Pfeifer from ARTME 3D®
- Link my product: [www.artme-3d.de](http://www.artme-3d.de)
- Indicate what has been changed
- Publish under the same license

Further details on the license can be found at

## 01.3 Use of the firmware:

The firmware is published under a **GPL license**, which enables you to do the following:

- Using the firmware.
- Changing the firmware.
- Passing on the firmware.

**This use is subject to the following conditions:**

- Do not use this code in products (extruders, 3D printers, CNC, etc.) that are closed source or protected by a patent.
- State my name: David Pfeifer from ARTME 3D .®
- Link my project: [www.artme-3d.de](http://www.artme-3d.de)
- Indicate what has been changed
- Publish under the same license (possible via Github)

Further details on the license can be found at <https://gnu.org/licenses/gpl.html>

# 02-Important information for the user of the extruder

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**Please read these operating instructions carefully and thoroughly to ensure safe and proper operation.**

## 02.1 Exclusion of liability

Failure to observe the safety instructions, documentation and operating instructions may result in injury to the operator, inferior results or damage to components. Always ensure that everyone who operates the extruder knows and understands the contents of these operating instructions. Always ensure that you have the latest version of the firmware installed on your extruder. We cannot control the conditions under which you assemble and operate the Original Desktop Filament Extruder Mk3. For this and other reasons, we accept no responsibility and expressly disclaim any liability for loss, injury, damage or expense arising from the assembly, handling, storage, use or disposal of the product. The information in this documentation is provided without any express or implied warranty as to its accuracy.

## 02.2 Explanation of the safety symbols



Take particular care when handling or touching the parts marked with this symbol and avoid other risks indicated by the following symbols.



Hot surface! The marked object may be hot and should be touched with special care.



Unprotected, moving mechanical parts can cause injuries, please be particularly careful.



Before carrying out any maintenance work, it is necessary to disconnect the appliance from the power source and familiarize yourself with the instructions.



Do not reach into the funnel.



This appliance consists of components that must be disposed of in accordance with the Waste Electrical and Electronic Equipment Directive.

## 02.3 General safety instructions

- Please be very careful with any interaction with the extruder. This extruder is an electrical device with moving parts and high temperature ranges.
- Prevent children from accessing the extruder unsupervised, even when the appliance is not in operation.
- Always switch off the extruder heating immediately if you are not extruding any material.
- Never leave the extruder unattended while it is switched on and heated up. The extruder has a temperature monitoring system and a number of intelligent functions to increase safety. However, there is a risk of fire if it is used contrary to the instructions in this manual or if components fail.
- Plastic is melted during extrusion, which leads to the formation of odors and vapors. Inhaling these vapors is harmful to health. Always set up the extruder in a well-ventilated area.
- Before processing a plastic, always find out about its properties and processing temperatures. Check the safety data sheet. If you have any questions, contact the manufacturer of the material.
- Some plastics can decompose thermally if heated for a long time or overheated, resulting in potentially toxic vapors.
- Do not use the appliance in living rooms or bedrooms.
- Wear suitable respiratory masks.
- It is recommended to install a carbon monoxide detector.
- Use monitoring systems for fire detection.

## 02.4 Intended use

The appliance is only suitable for extruding thermoplastics with a processing temperature below 260°C. Any other use is not intended. The extruder is also primarily designed for processing common 3D printing materials such as PLA, PETG and ABS. The processability of other plastics cannot be guaranteed.

## 02.5 Warranty

The parts of the Original Desktop Filament Extruder MK3 are covered by a 24-month warranty for end customers in the EU and a 12-month warranty for business customers and end customers in the rest of the world. Consumables and wear parts are excluded from this warranty. The warranty period begins on the day the customer receives the goods. The seller is not liable for damage caused by improper handling of the purchased product or by handling contrary to the information and recommendations contained in the official manuals and instructions. The warranty also expires in the event of improper interventions and the use of unofficial hardware and software modifications.

## 02.6 Installation and basic use

- Always operate the extruder in a dry environment. Set up the extruder in a safe, dry place on a horizontal and stable surface - e.g. on a work table. Make sure that the extruder is set up in such a way that it cannot fall over or drop to the floor. There should be at least 30 cm of space around the extruder. If there are obstacles near the extruder, this can impair the operation of the extruder or lead to excessive wear of the cable sheaths or even the cables themselves. Worn cables can pose a risk (electric shock, fire).
- This appliance is intended for indoor use only. Do not expose the device to water or snow. Contact with water and other liquids can lead to damage to the electronics, short circuits and other damage.
- Ensure that the work area is sufficiently ventilated. Plastic is melted during extrusion, which leads to the formation of odors and vapors. Inhaling these vapors is harmful to health. If the room ventilation is not sufficient, it must be supplemented by an active extraction system.
- Ensure that no fans or housing openings are blocked. Insufficient cooling can lead to overheating and serious damage to the device (risk of damage to the electronics, fire).
- If the extruder is damaged, stop using the appliance, switch it off immediately and contact us for assistance. Damaged cables pose a safety risk - there is a risk of electric shock or fire.
- Protect the extruder from direct sunlight.
- Avoid draughts and do not use a room fan.

## 02.7 Electrical safety

- The extruder is powered via a household socket - 230 VAC / 50 Hz or 110 VAC / 60 Hz. Never connect the extruder power supply to any other power supply as this may result in malfunction or damage to the extruder. Never use the extruder if the power cables are damaged in any way. This applies to the power cable, the power supply cable and the wiring of the extruder. There is a risk of electrical injury.
- Never disassemble the extruder's power supply unit. It does not contain any parts that could be repaired by an unskilled worker. All repairs must be carried out by a qualified technician. Tampering with the power supply may result in damage to the appliance and/or electrical hazards.
- The plug of the mains cable serves as a separating element. The socket outlet must be easily accessible.
- Lay the connecting cable to the power source in such a way that you cannot trip over it, step on it or otherwise cause damage. Make sure that the power cable is not damaged mechanically or in any other way. Do not use damaged cables and replace them.
- Only use the original power supply unit supplied.

## 02.8 Mechanical hazards

- Caution: rotating parts and self-starting movements! Do not reach into the interior of the extruder while it is in operation. Injury can be caused by the rotating parts. Fingers can be crushed. Loose parts, clothing, long hair, jewelry or other objects can be pulled in by rotating parts.
- If dangerous situations arise during operation of the extruder, you can switch off all dangerous processes immediately by pressing the STOP button on the display.

## 02.9 Risk of burns

- Do not touch the heating element or the heated pipe when the extruder is in operation or warming up. Note that the temperature of the nozzle and the heating elements can be up to 300 °C (572 °F). Temperatures above 40 °C (104 °F) can damage the human body.

## 02.10 Transporting the appliance

- If you want to move the Original Desktop Filament Extruder MK3S, grip the frame profile on the right and left. Never lift the extruder by the cables, attachments or the gearbox.



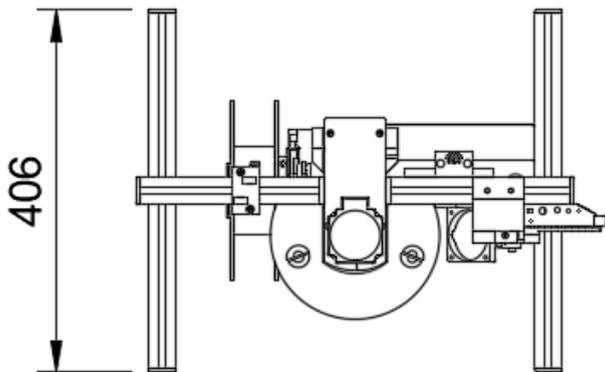
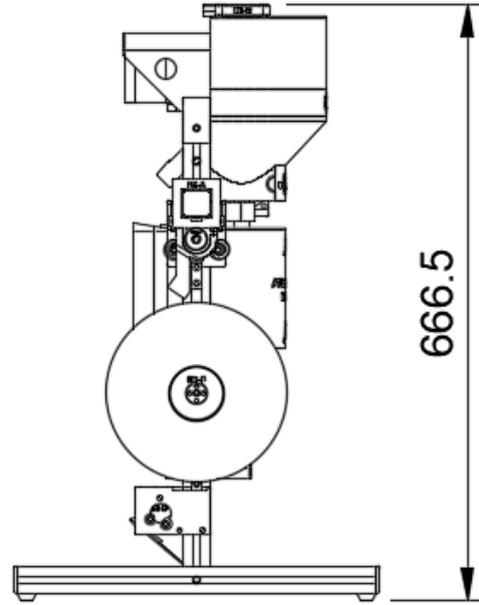
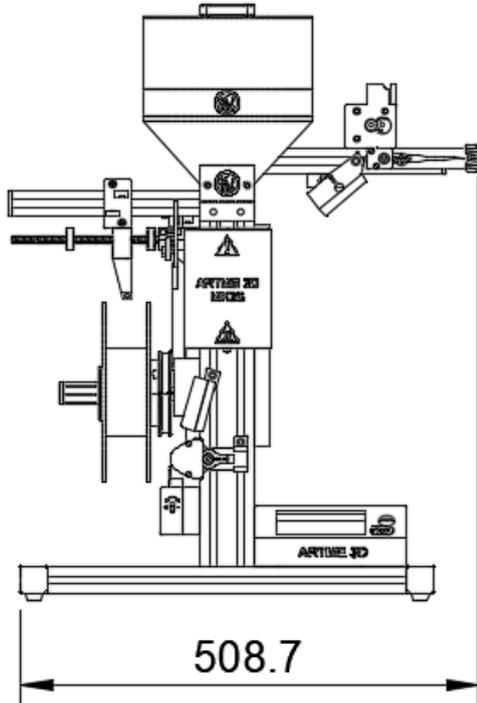
# 03-Product information

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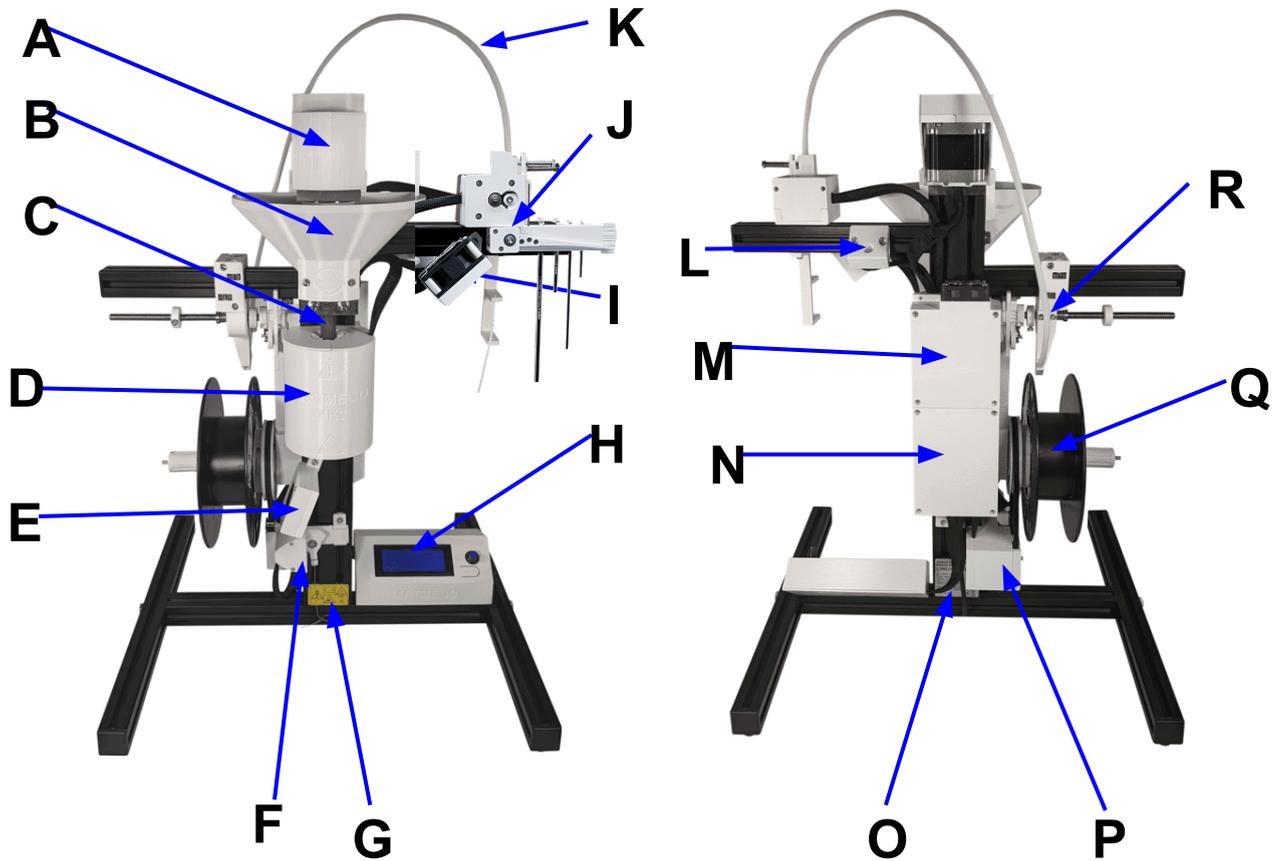
## 03.1 Data of the kit

- Name: Original Desktop Filament Extruder MK3S and MK3S+ by ARTME 3D® (kit)
- Contact: E-Mail: kontakt@artme-3d.de, Phone: +4915771417817
- Filament: 1.75 mm and 2.85 mm
- EEE group: 3 (IT and/or telecommunication devices), device use: only indoors
- Dimensions: 509 mm wide, 667 mm high, 406 mm deep
- Manufacturer: Artme GmbH, Ludwigstraße 202, 67165 Waldsee, Germany
- Device use: indoors only
- Power supply: AC/DC switching power supply, input 100-240 VAC, 50/60 Hz, 2.0 A / output 24V, 5 A, 120 W max, complies with Part 15 of the FCC rules
- Fuse: SMD fuse, permanently soldered
- Working temperature range: 19 °C to 27 °C
- Humidity: maximum 70 %
- Gewicht des "MK3S light" Bausatzes (brutto / netto): 4,5 kg / 3,8 kg
- Gewicht des "MK3S" Bausatzes (brutto / netto): 8,40 kg / 7,0 kg
- Gewicht des "MK3S+" Bausatzes (brutto / netto): 8,75 kg / 7,3 kg
- The serial number is supplied and must be affixed to the frame yourself.
- Maximum temperature: 260°C
- Maximum speed: 30 rpm at 6NM
- Heating time from 20 to 185°C approx. 15 minutes
- Extruder screws V1 with delivery by December 19, 2025:  
The high-compression extruder screw has two round markings on the shaft and has the following specifications:  $\varnothing$ 12mm, total length 215mm, 3 zones. Compression ratio 3:1.  
The low compression extruder screw has one round mark on the shaft and has the following specifications:  $\varnothing$ 12mm, total length 215mm, 3 zones. Compression ratio 2:1.
- Extruder screws V2 with delivery from December 23, 2025:  
The high-compression extruder screw has two oval markings on the shaft and has the following specifications:  $\varnothing$ 12 mm, total length 215 mm, 3 zones. Compression ratio 2:1.  
The low-compression extruder screw has an oval mark on the shaft and has the following specifications:  $\varnothing$ 12 mm, total length 215 mm, 2 zones. Compression ratio 1.1:1.
- Maximum spool size: 2kg spools with a diameter of 300mm and a width of 100mm.
- Filament diameter accuracy: +/- 0.05mm when using granules/pellets. +/- 0.07mm when using shredded 3D print waste.
- Maximum extrusion output without filament calibration, without melt filter and with 1.7 mm nozzle:: 450 grams per hour (tested with Ingeo 4043D PLA, 210°C, 30RPM, extruder speed with high compression)
- Normal extrusion output with filament calibration, melt filter and 1.7 mm die: 250 to 350 grams per hour (0.25 to 0.35 kg/h), depending on the material. (Filtering, cooling, calibrating and winding reduce the maximum extrusion capacity slightly).
- Maximum system speed (producing and winding filament true to size): 1.0m to 1.6m per minute.  
Experience shows that it takes on average approx. 4 to 6 hours to produce approx. 1kg of filament with a diameter of 1.75mm.
- Tested materials: PLA, ABS, ASA, PETG, TPU
- Drive motor gear ratio: 15 : 1 (3D printed gearbox on the MK3S or a planetary gearbox on the MK3S+)

### 03.2 Dimensions and drawing



### 03.3 Definition



- A: Extruder motor with gearbox
- B: Hopper
- C: Extruder tube
- D: Heating element and insulation
- E: Filament fan 1
- F: Sensor
- G: Warnings
- H: Display
- I: Filament fan 2
- J: Pulling unit with analog measuring device and tool holder
- K: PTFE hose
- L: Storage bracket for gearbox
- M: Electronics housing
- N: Electronics housing
- O: Nameplate with serial number
- P: Spool drive
- Q: Spool
- R: Filament guide

# 04-Overview of operating elements

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## 04.1 Switching on, switching off, switching on again

### 4.1.1 Switching on:

- Connect the power supply unit to a power socket to switch on the extruder.

### 4.1.2 Switching off

- Stop the extruder motor (Main menu - STOP Extruder).
- Switch off the heating (Main menu - Cooldown).
- Cooling will take some time, as very little heat is lost due to the insulation of the extruder.
- Disconnect the extruder from the power supply by pulling the mains plug of the power supply unit out of the socket. Make sure that nobody can burn themselves on the hot parts of the extruder. Ensure that there is no voltage after switching off.

### 4.2.3 Switching on again

- Heat the extruder to the desired temperature.
- Once the temperature has been reached, you can start the extruder motor.
- The system is not yet stable as the heat distribution in the system is not yet even. Allow the extruder to run until the extruder screw is filled with new plastic and extrusion is uniform. This can take 3 to 10 minutes. The old plastic may have changed its properties (degradation) due to the slow cooling process after switching off and may be slightly thinner or burnt than the new plastic that then flows in. If the extrusion is not uniform, please refer to chapter 16.1 for the most common causes of problems.

## 04.2 Display and operating elements

The extruder is supplied with the control unit in English. If you want to change the language, you can do this by reinstalling the firmware and selecting your language. You can find the instructions for this at [.www.github.com/ARTME3D/Desktop-Filament-Extruder-MK3](https://www.github.com/ARTME3D/Desktop-Filament-Extruder-MK3)

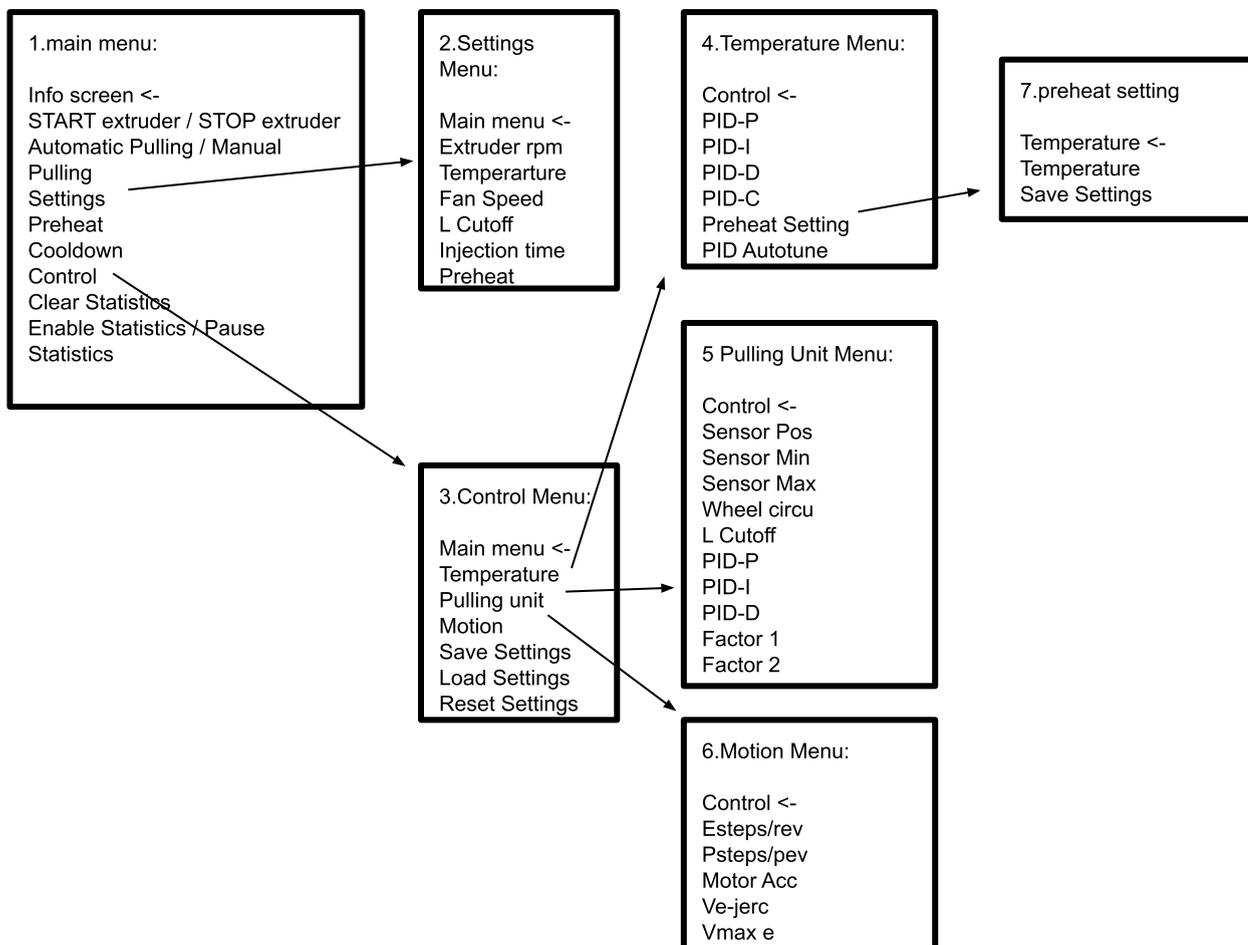
After the extruder has been switched on, you will see the **information view** (Info Screen). The translation and explanation can be found here:



Pos.	English		Explanation
1	Temperature		Actual temperature / set temperature of the extruder in °C (degrees Celsius)
2	E (extruder)		Speed of the extruder motor in revolutions per minute (rpm) (only visible when extruder is heated up and extruder motor started, otherwise COLD rpm)
3	S (sensor)		Measured value of the sensor
4	Avg: average, Max: maximum value, Min: minimum value		Average, maximum value and minimum value of the sensor measured value
5	P (Pulling Unit)		Speed of the pulling unit motor in revolutions per minute (rpm)
6	L (Length)		Filament length in meters
7			Info line.
8	STOP		When this button is pressed, the extruder switches off all motors and heaters.
9	Rotary Knob		The rotary knob next to the display can be pressed and turned to the left and right. To access the main menu, press the rotary knob. To scroll down in the main menu, turn the rotary knob to the right. To scroll upwards, turn it to the left. To make a selection, press the rotary knob in the corresponding position. <b>The entry is made when you release the knob. The knob must have been pressed for at least 120 milliseconds beforehand. If it is pressed too quickly, the knob may not respond.</b>

## 04.3 Menu structure

The translation and explanation of the menu can be found on the next page. The menu structure is shown here in English, as this is how the device is supplied:



## 1. main menu / Main menu:

English		Explanation
Info Screen		Back to the information view
START extruder / STOP extruder		Starts the extruder motor, note that the extruder temperature must be above 150°C, otherwise it cannot be switched on.
Automatic pulling / Manual pulling		Starts or stops the regulation of the automatic pulling speed
Settings		Submenu for presetting the most important parameters
Preheat		Preheat to 180°C, this value can be changed, see chapter 07.1
Cooldown		Switch off the heating
Control		Submenu for setting controls, see below
Clear Statistics		Sets the filament length counter reading and the min/max sensor reading to zero
Enable Statistics/ Pause Statistics		Stops filament length counter reading and min/max sensor reading, then "Enable Statistics" to resume

## 2. settings / settings

English		Explanation
Main		Back to the main menu
Extruder RPM		Setting the extruder speed in revolutions per minute
Temperature		Setting the extruder temperature in °C
Fan speed		Speed of the filament fan under the nozzle from 0 to 100 %
L cutoff		Setting the filament length at which to switch off, specified here in millimeters
Injection time		When the injection molding mode is activated, the extruder runs for the set time. See chapter 07.3
Preheat		Preheat to 180°C, this value can be changed, see chapter 07.1

## 3. control:

English		Explanation
Main		Back to the main menu

Temperature		Submenu for setting the extruder temperature, see below
Motion		Submenu for controlling the motor settings
Pulling Unit		Submenu for setting the automatic rewinder
Save Settings		Saves the current speed of the extruder, drawing unit and fan
Load Settings		Loads the last saved speed values and setting values
Reset Settings		Loads the original default settings of the firmware

#### 4. temperature:

English		Explanation
Control		Back to the Control menu
Temperature		Setting the extruder temperature in °C and heating up
PID-P		Setting value P of the control behavior of the PID temperature control
PID-I		Setting value I of the control behavior of the PID temperature control
PID-D		Setting value D of the control behavior of the PID temperature control
PID-C		Setting value C of the control behavior of the PID temperature control
Preheat setting		Submenu for setting the preheating temperature
PID Autotune		Starts several heating phases to determine the PID values for the heating; these are preset for the MK3 and do not need to be changed

#### 5. pulling unit / pulling unit:

English		Explanation
Control		Back to the Control menu
Sensor Pos		Factor for the height of the desired sensor arm position, see chapter 05.1
Sensor Min		see chapter 5.1
Sensor Max		see chapter 5.1
Wheel circ		Circumference in mm of the wheel on the pulling unit, see chapter 05.2
L cutoff		Setting the filament length at which to switch off, specified here in millimeters

PID-P		Setting value P of the control behavior of the rewinder
PID-I		Setting value I of the control behavior of the rewinder
PID-D		Setting value D of the control behavior of the rewinder
Factor 1		Experimental: Factor for the sensor value display. When using a Hall sensor to measure the diameter of the filament.
Factor 2		Experimental: Factor for the sensor value display. When using a Hall sensor to measure the diameter of the filament.

## 6. motion / movement:

English		Explanation
Control		Back to the Control menu
Esteps/rev		Number of steps per revolution of the extruder motor
P steps/mm		Number of steps per revolution of the motor of the pulling unit, see chapter 05.2
Motor Acc		Acceleration value
Ve-jerk		Jerk setting
Vmax e		(V Setting

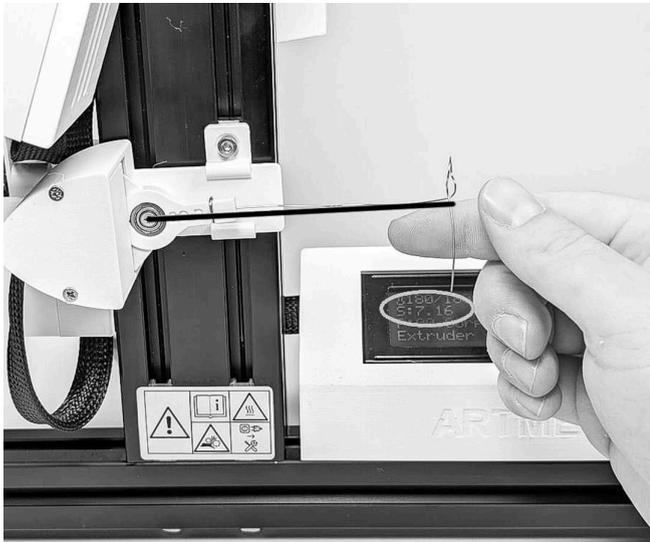
## 7. preheat setting / preheat:

English		Explanation
Temperature		Back to the Temperature menu
Temperature		Set the target temperature to which the "Preheat" function heats up
Save Settings		Saves the temperature setting

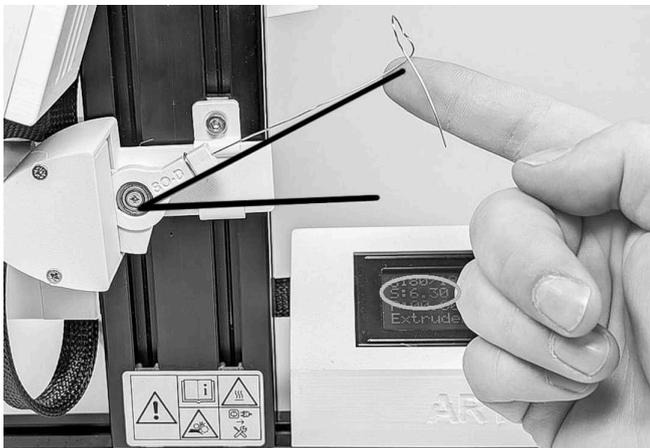
# 05-Set and prepare device

## 05.1 Calibrating the sensor

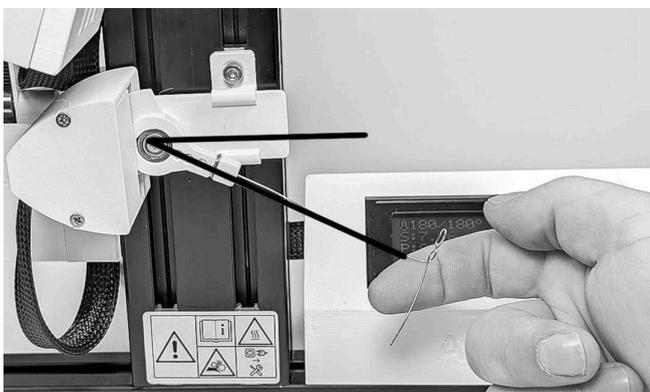
The extruder's sensor is responsible for automatically regulating the drawing speed of the filament so that the tensile force on the filament always remains the same. The sensor consists of an optical light barrier and a 3D-printed sensor arm with an aperture. This aperture must be printed in white (opaque) color. This aperture is illuminated by the light barrier. To enable the control unit to function correctly, it is essential that you carry out these steps:



1. on the information view of the display, you will see the sensor value under "S:", which changes when the sensor is moved. Hold the sensor arm horizontally and read the value. Now set this value under Main menu - Control - Pulling Unit - Sensor Pos. Save the entry under Main menu - Control - Save Settings. The control unit always attempts to maintain this position during automatic rewinding by regulating the speed of the pulling unit.



2. now hold the sensor in the position shown and read the value on the display under "S:" again. Now set this value under Main menu - Control - Pulling Unit - Sensor Min. Save the entry under Main menu - Control - Save Settings. If this position is exceeded for longer than 30 seconds during operation, the extruder switches off automatically (sensor error). This is to ensure that the extruder extrudes plastic in an uncontrolled manner in the event of a winding malfunction and thus damages itself.



3. now hold the sensor in the position shown and read the value on the display under "S:" again. Now set this value under Main menu - Control - Pulling Unit - Sensor Max. Save the entry under Main menu - Control - Save Settings. If the value falls below this position for longer than 30 seconds during operation, the extruder switches off automatically (sensor runout). This is to ensure that the extruder extrudes plastic in an uncontrolled manner in the event of a winding malfunction and thus damages itself.



4. adjust the distance between the sensor and the extruder nozzle by loosening the small screw on the sensor holder, sliding the sensor up or down and reattaching it. The distance to the nozzle is measured at the point where the filament touches the sensor when it is horizontal. Depending on the material, the distance can be between 60 and 120 mm. Settings can be found in chapter 06.6. The same applies to the fan under the nozzle.



5. the sensor can now be removed by pulling it out to the left. Put it to one side. This has the advantage that the sensor will not be damaged if hot, soft plastic comes out of the nozzle when the extruder starts up.

6. make sure that the sensor is never exposed to direct sunlight during operation. This would change the measured value and interfere with filament calibration and rewinding. Especially if the extruder is located near a window and runs for several hours, it can happen that the sun hits the extruder after some time. This should be prevented.

## 05.2 Calibrating the pulling unit

The toothed wheel (component SP-16 extruder feed wheel) on the drawing unit has a diameter of 12 mm. The control unit is adjusted to this so that the calculation of the filament length is correct. **Only if you are using a feed wheel with a diameter other than 12 mm do you need to carry out the following steps:**

1. To do this, measure the diameter of the wheel with a caliper gauge.
2. To be able to enter a value in the control unit, the circumference of the wheel must first be calculated from the measured diameter. You can use an online circle calculator to do this and enter the diameter to obtain the value of the circumference. Or you can calculate it using the following equation (The \* sign means multiply.)

$$U=2*\pi*r$$

So you calculate 2 \* 3.14 \* half of the measured diameter.

An example:

If you measure a diameter of 12mm on the puller wheel, calculate 2 \* 3.14 \* 6. This results in a circumference of 37.7 mm.

Enter this value under Main menu - Control - Puller PID - P circ. The value must be entered in millimetres. Then save the setting (Main menu - Control - Store memory)

3. Now the number of steps of the stepper motor of the pulling unit must be adjusted. To do this, the following calculation must be made:

$\text{steps/rev stepper motor} * (\text{factor microstepping} / \text{measured diameter})$

In the case of the MK3 extruder, the value "steps/rev stepper motor" is: 200

The "Microstepping factor" value for this MK3 extruder is: 2

The value of the calculated diameter based on the above example: 37.7

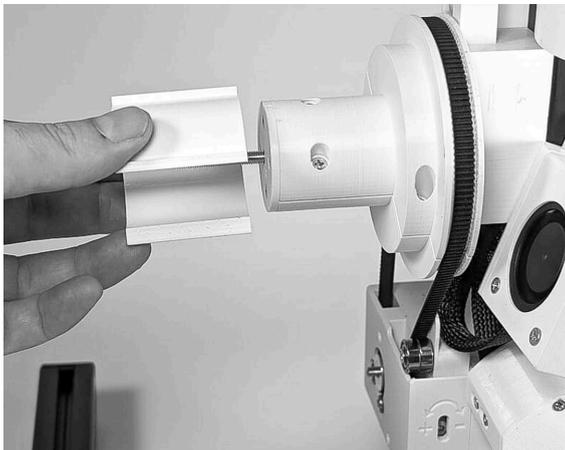
To complete the above example, calculate  
 $200 * (2 / 37,7)$

So first calculate  $2 / 37.7 = 0.05305$ . Save the value or write it down.  
Then calculate  $200 * 0.05305 = 10.61$

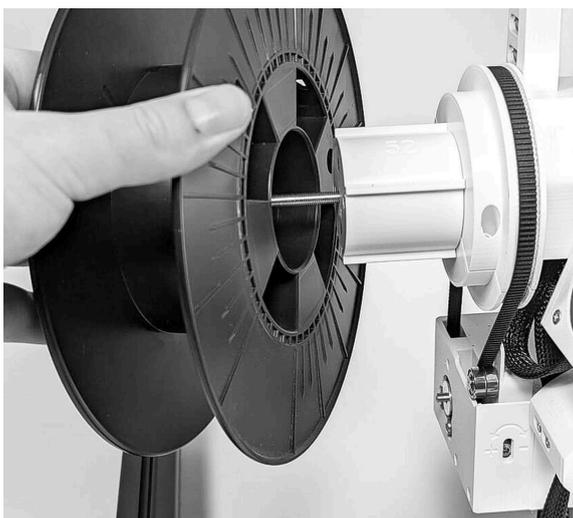
Enter the calculated value under Main menu - Control - Motion - Psteps/mm. Then save the setting (Main menu - Control - Save Settings)

## 05.3 Preparing and adjusting the spool

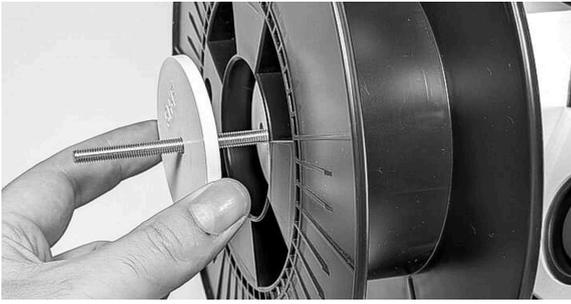
The toothed belt on the spool drive is used to keep the filament under tension while it is being wound up. It therefore spins slightly during operation, similar to a slipping clutch. If the tensile force is too low, this can have a negative effect on the winding process. If the tensile force is too high, the spool motor can be blocked. The belt tension must therefore be adjusted. To do this, first install the spool:



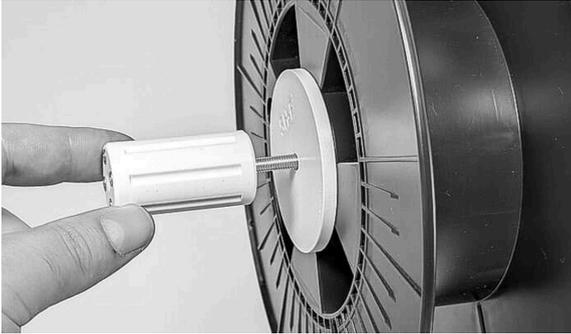
1. print the appropriate adapter (3D printed part SH-G), depending on the inner diameter of the spool. Slide the adapter onto the spool holder.



2. then place an empty filament spool on the spool holder.



3. place the washer on the fastening screw.



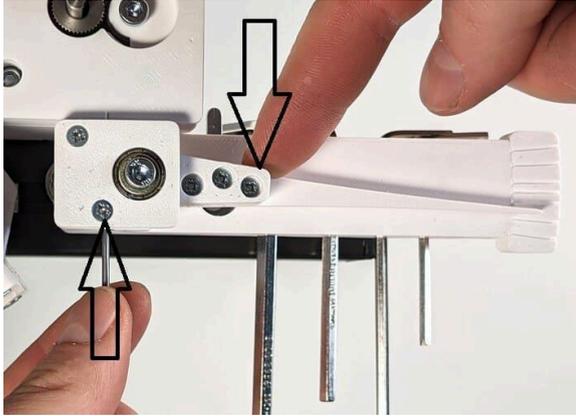
4. tighten the clamping screw. Depending on the width of the spool you are using, you can use the clamping screw from both sides. **Please tighten so that the washer bends slightly inwards. It is important that this screw does not come loose during operation.**



5. now start the extruder (when cold). To do this, select START Extruder in the main menu. The spool will now rotate. **Hold the spool with your hand and feel approximately how strong the pulling force is. If you hardly feel any pulling force, the belt must be tightened. If it pulls quite strongly or the motor stalls, the belt must be loosened. But in any case, the belt must be able to continue moving when you stop the reel by hand.** There is a set screw on the reel drive for this purpose. You can turn this screw with a 3 mm Allen key. If you turn the screw anticlockwise, the belt tension is increased. If you turn the screw clockwise, the belt tension is reduced. Make the

adjustment in small steps. If the adjustable range does not produce the desired result, the spool drive must be mounted 1 to 2 mm higher.

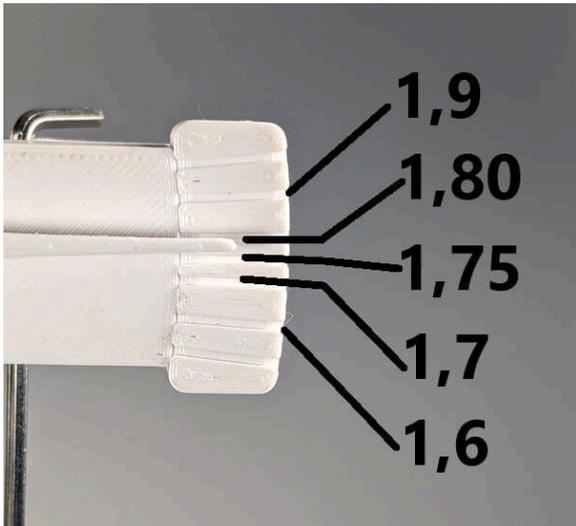
## 05.4 Calibrate mechanical filament measurement



05.4.1 A spring steel wire with a diameter of 1.8 mm is supplied in the kit (bag number 13). This is inserted into the analog measurement from below. Then press the pointer of the measurement down with a finger so that the components and ball bearings are free of play.



05.4.2 The calibration can then be carried out by loosening the screw in the scale.



05.4.3 **Adjust the scale so that the pointer is on the line above the center point. This corresponds to 1.8 mm. See photo. You can then refasten the clamping screw.**



05.4.4 The steel pin for calibration, as well as common tools and the feather key from the extruder drive can be stored here. **Repeat the calibration from time to time and also check the filament diameter with a caliper gauge.**

# 06-Material Requirements

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**The material to be processed must be well prepared. Regardless of whether you process pellets or regrind with the extruder, there are strict criteria for successful filament production. Please read this chapter very carefully. These requirements generally apply to every extruder.**

## 06.1 Material selection

06.1.1 Basically, the extruder is designed for processing plastics that are suitable for processing in 3D printers. In order to be able to produce high-quality filament, you need to know what kind of material you are processing. If you buy PLA pellets on the internet, for example, you should always request a data sheet. This is because there are PLA pellets for use as filament in 3D printers, but also for film production or injection molding. These pellets will look very similar, but can differ greatly in their melting behavior. This is very critical for processing in an extruder of this small design. The same is possible with PETG and ABS. So always try to get the data sheet for the material in question.

06.1.2 The same applies to the processing of 3D printer waste. You must be able to trace the manufacturer and the type of plastic from which the waste originates.

06.1.3 There are also more and more highly modified grades such as PLA+ and other high performance bioplastics such as materials from "Extrudr", as well as the so-called "high flow" filaments. These become very fluid and it can be more difficult to make a dimensionally stable filament from them. It is also possible that such materials cannot be processed at all with this small system. It always depends on the experiment, as it is difficult to predict.

06.1.4 Other materials such as PP, PA or PE are special cases. Although these can usually be extruded, it is often not possible to calibrate a good filament with this setup. This is only because these materials harden very quickly after leaving the nozzle. Calibration via gravity therefore often does not work.

06.1.5 PET from shredded bottles is also a special case. The original Desktop Filament Extruder MK3S is generally not designed for processing PET and especially not shredded PET bottles. PET is a technical polymer that has high processing temperatures and is generally not easy to process. PET is available as an amorphous or semi-crystalline thermoplastic. When recycling, it is often not known which material it really is. The extruder can extrude a few types of PET in pellet form. But processing shredded PET bottles is much more difficult. If you shred PET bottles, you get a very "flaky" regrind. This regrind does not trickle well and simply does not slip through a hopper. In addition, the regrind has a high air content, which means that the geometry of the current extruder screws may not be optimal. It is also important to know that although the extruder then extrudes the material, the calibration to filament often does not work at the moment, simply because PET solidifies again very quickly once it has left the nozzle. As a result, the calibration used here may not work due to its own weight. The calibration and the arrangement of the extruder might have to be modified. It is also important to mention that it is difficult to change from PET to another material. Cleaning pellets may be necessary for this.

06.1.6 Soft materials like TPE and TPU often work with both extruder screws. But I have not tested very much. Therefore I cannot guarantee it.

## 06.2 Drying

**Plastic pellets must be dried before processing, as many plastics absorb moisture from the air, which has a negative effect on extrusion and causes bubbles in the filament.** If you do not have access to a drying cabinet or granulate dryer, this can also be achieved with a commercially available dehydrator.

Recently, drying in a microwave has also been mentioned on the Internet. However, I have not yet tested this. There are also more and more commercial filament dryers. These are also suitable for drying granules.

Experience values are: PLA 45°C over 4-8 hours. PETG 60°C over 4-8 hours. ABS 60°C over 3 to 7 hours. If

no air circulates during the drying process or no fresh air is supplied, the drying time may be longer.

## 06.3 Varietal purity and color separation

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

It also makes sense to separate by color, as you can then create a new color if you specifically mix two or more colors. If you mix too many colors, you will end up with a brown or grey filament.

## 06.4 Grain size and flowability

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



Each grain may be a maximum of 5 mm long on the longest side. All other sides must be smaller than 4 mm. **Pellets must be sieved before they are filled into the hopper. Use a sieve with round holes (approx. 4.5 to 4.8 mm diameter).** The reason for this is that a few larger pellets or clumps may sometimes be present during production, which then block the feed zone of the extruder screw:

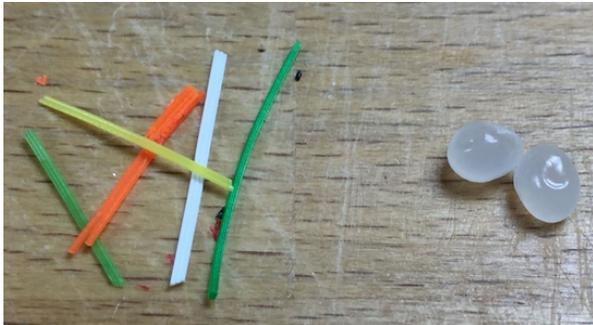


#### 06.4.2 For self-produced granulate (regrind/shredded 3d pressure drop):



Each grain should not be longer than 4.5 mm on all sides. Thin and elongated pieces can usually be slightly longer (6-7 mm). This can be ensured by sieving the material before use. The sieve must have round holes with a diameter of 4 to 5 mm (component ED-I). Self-produced granules must be mixed homogeneously. Another criterion for self-produced granules is their flowability. Compared to brand-new granulate, self-produced granulate made from plastic waste usually trickles much less easily. It also tends to form bridges. This means that cavities form in the granulate as it becomes wedged at narrow points in the hopper and therefore no material may reach the extruder screw, even though the hopper is apparently full. This can happen especially with regrind made of PLA with a small grain size. If you have problems with bridging, install component ED-A.2 on the coupling of the extruder screw (the ED-F cover

for the hopper is then also required). When collecting 3D print waste, note the following: Thin strips, which result from a "brim" or skirt on the print bed, are difficult to shred and can obstruct the material flow in the feed zone of the extruder. Therefore, please sort out such parts or shred them further.



### 06.5 Cleanliness and storage

Protect all types of granules from dust and contamination. Use containers with lids. The melt filter in the extruder nozzle only ensures that the filament can be processed on 3D printers with a 0.4 mm nozzle. The filter is not suitable for filtering large quantities of contaminated material. Many other types of contaminants cannot be stopped by the filter or cause the filter to clog prematurely.

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

### 06.6 Experience and settings

Here are a few example settings for various tested materials. You can use these values to start the extruder. Depending on the material you are using, other values may be necessary. If I am talking about PLA or PETG, it is still possible that the material you are using will behave differently. An example: PLA granulate for 3D printer applications is sold on ebay, I have requested the data sheet for the material. In the data sheet, the PLA is labeled for packaging applications. So PLA is not the same as PLA. Once you have found the right settings

for your material, starting the extruder is very quick and easy. To calibrate the filament diameter, follow the next chapters of the operating instructions (chapters 07, 08 and 09). Use these values as the starting value:

### **06.6.1 PLA:**

#### **PLA pellets:**

Extruder screw: low compression

Temperature: 170 - 200 °C

Extruder RPM: 12-20 (depends on the size, shape and brand of your pellets)

Puller RPM: 30-40

Distance sensor - die: 70-120mm

Fan power: 80-100%

Nozzle size: 1.7 mm

Note: Fan inclined towards the sensor, Motor current 2.5A - 3.2A

#### **PLA regrind** (shredded 3D printing waste):

Extruder screw: high compression

Temperature: 170 - 185 °C

Extruder RPM: 18-20 (depends on the size, shape and brand of your regrind)

Puller RPM: 30-40

Distance sensor - nozzle: 70-120mm

Fan power: 50-100%

Nozzle size: 1.7 mm

Note: Fan tilted towards sensor, keep hopper filled, Motor current 2.5A - 2.8A

### **06.6.2 PETG:**

#### **PETG pellets** (without masterbatch):

Extruder screw: low compression

Temperature: 205 - 220 °C

Extruder RPM: 10-14

Puller RPM: 30-35

Distance sensor - nozzle: 90-120mm

Fan power: 40-80%

Nozzle size: 1.7 mm

Note: Fan inclined towards the sensor. PETG must be very well dried, PETG without additives such as masterbatch requires a lot of motor power as it is very tough and highly viscous. The speed must therefore be kept relatively low. The extruder motor may lose steps. A squeaking noise may occur, as the melting process in the compression zone is relatively slow in favor of reclosing. In some cases, the motor current of the stepper motor driver must be increased (2.9A). The motor may then have to be actively cooled.

#### **PETG pellets** (with 3.5% micro masterbatch):

Extruder screw: low compression

Temperature: 205 - 210 °C

Extruder RPM: 17

Puller RPM: 24-27

Distance sensor - nozzle: 170mm

Distance fan - nozzle: 100mm

Fan power: 10-13

Nozzle size: 1.7 mm

Note: Motor current 2.5A - 3.2A

### **PETG regrind** (shredded 3D printing waste):

Extruder screw: high compression

Temperature: 195 - 230 °C

Extruder RPM: 7-20 (depends on the size, shape and brand of your regrind)

Puller RPM: 30-35

Distance sensor - nozzle: 100mm

Fan power: 30-60

Nozzle size: 1.7 mm

Note: Fan inclined towards the sensor, Motor current 2.5A - 2.8A

### **06.6.3 ABS:**

#### **ABS pellets:**

Extruder screw: high or low compression

Temperature: 195 - 205 °C

Extruder RPM: 13-20 (depends on the size, shape and brand of your pellets)

Puller RPM: 30-40

Distance sensor - nozzle: 120mm

Fan power: 20-60

Nozzle size: 1.5mm or smaller

Note: Fan inclined to the sensor, filament tends to twist in front of the pulling unit, then produce faster or cool lower. ABS must be very well dried

## **06.7 Coloring the filament**

### **06.7.1 Coloring with masterbatches:**

The mixing capacity of an extruder in this small design is naturally limited. Coloring with masterbatches is possible, but is limited in terms of homogeneity. There are masterbatches that can negatively influence or disrupt the extrusion performance. Therefore, only start with a small amount and work your way up to the maximum addition. The agitator screw on the coupling of the extruder screw should not be installed if pellets with masterbatches are used. The addition of masterbatch is calculated by weight and should be from 2.5% to 3.5% of the weight of the pellets. The filament calibration settings must then be adjusted. It is usually necessary to increase the speed of the extruder motor, as the friction in the extruder tube is reduced by the masterbatch. If you want to change the color or switch to natural-colored material, it may be necessary to remove the extruder screw and clean it manually. See chapter 12 in the operating instructions.

The use of micro masterbatch has proven itself with small extruders. The homogeneity of the color is significantly better than with standard masterbatch. The dosage of micro masterbatch can range from 2% to 4% by weight. Micro Masterbatch in the colors white, black, red and blue is already available in my [online store](#). More colors will follow soon.



**Important to know:** When using masterbatches in small extruders, the diameter tolerance of the filament can be negatively affected. The filament is still easy to print, but the diameter fluctuations may be visible in the print image later on. To prevent this, it is advisable to carry out the coloring in two extrusion processes.

In the first pass, coloring is done with masterbatch and produced relatively quickly without paying attention to the diameter of the filament. The diameter can also be larger than the required 1.75 mm. The filament produced is then processed back into pellets. This is done with a pelletizer (device for shredding filament). The pellets are then processed into filament once again using the extruder, which results in a good diameter tolerance and color homogeneity.

### 06.7.2 Coloring with pigment



Customers report that pigments for coloring epoxy resin also work well for coloring plastic pellets. However, the material becomes semi-transparent. However, handling pigments can be difficult and messy.

### 06.7.3 Coloring with filament residues



Most commercial filaments on the market are highly pigmented. If you grind filament remnants back into pellets (e.g. with a pelletizer) and use them as a "masterbatch substitute", you often get good color results.

## 06.8 Selecting the extruder screw

The extruder kit is supplied with two different extruder screws:

The high compression extruder screw is designed for processing **shredded 3D printer waste** made from PLA, ABS and PETG. Simply because there is often a high air content in self-produced regrind. In addition, the extruder screw with its high compression offers a larger opening in the feed zone, which is an advantage with regrind. Depending on the particle size, however, the low compression may also be necessary for PETG regrind. In addition, the high compression can also be used to process certain plastics in pellet form, such as PLA types (optimized for 3D printing, not for packaging applications) and ABS. This screw is marked to distinguish it from the other one (2x round indentation on the shaft). The low compression extruder screw is designed for processing plastics in **pellet form** such as PLA, ABS, ASA, PETG. This screw is marked to distinguish it from the other one (1x round counterbore on the shaft).

## 06.9 Shredder solutions

Shredding 3D printer waste usually requires powerful and expensive machines. I would like to show you several options below:

06.9.1 The most convenient solution with the best granulate quality is a normal industrial shredder, also known as a granulator. Ideally, such devices have toothed cutting blades and a replaceable screen so that the granulate size can be determined. However, this will cost a little more and often requires a power connection.

06.9.1 There are currently also tabletop shredders for recycling 3D printer waste. For example from Hellweg, Polystruuder, etc.). However, they are still quite expensive.

06.9.2 An open source solution for powerful shredders comes from the Precious Plastic movement. Ready-made machines can also be purchased in the online bazaar: <https://bazar.preciousplastic.com>. But even these devices are not very cheap and are often only suitable for recycling in injection molding machines and plate presses. AND CAUTION: Problems have arisen with this model in the past. This type of shredder is not designed for the required particle size of less than 5 mm and metal abrasion is often found in the ground material, which then very quickly and often clogs the extruder nozzle.

06.9.3 On a small scale, a so-called side mill or sprue mill can also be used. These types of grinders are occasionally available cheaply in classified ads or at industrial auctions. These mills also have a built-in sieve. The disadvantage of these grinders is that the inlet is quite small and larger 3D prints have to be pre-crushed and a power connection is also required.

06.9.4 An alternative to these large and expensive machines can be the shredding of 3D printer waste in a kitchen blender. Customers report initial references in this area from the following appliances:

-Total stand mixer from Blendtec (purchase price approx. €400)

-Arendo blender 2000 W incl. blender jug 2.0 L 32,000 rpm. (purchase price approx. 55€)

It is important that these blenders have a powerful motor in combination with blunted blades. This chops the 3D print waste relatively evenly without cutting it. The short running time generates little heat. The material should be passed through a sieve and can then be used in the extruder. However, only PLA and PETG have been tested so far. Cheap kitchen blenders with sharp blades do not fulfill this purpose. The power is not sufficient and the material can melt due to heat development.

06.9.5 Another favorable approach is a roller shredder. It is important to use a shredder with a slowly rotating knife roller. Normal, fast-rotating blade shredders would melt the plastic. However, I have found that very cheap devices introduce some metal abrasion into the ground material, which can discolor the material and cause the melt filter to clog prematurely. It is therefore better to opt for appliances in the 200 to 250 euro price range. However, these devices generally work quite well, they have enough power and can be operated from a normal socket. High-quality roller shredders are also quite quiet. However, there is a limit to the size of the waste to be processed. Large pieces have to be shredded with a hammer or saw. However, initial tests were very promising. I am working on installing a kind of sieve carrier in such devices. This turns the material in a circle and crushes it until it can fall out through the sieve. This produces usable ground material.

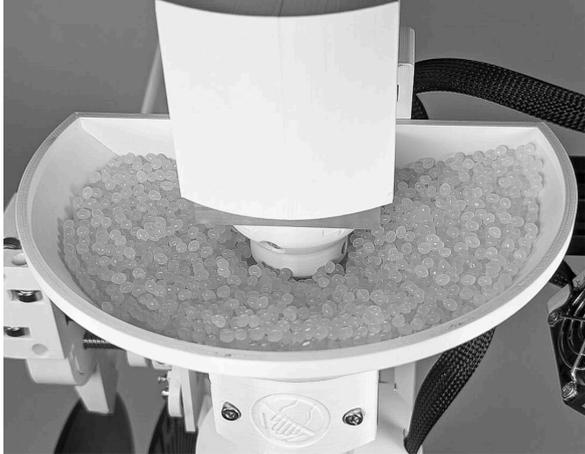
# 07-Start extruder

**CAUTION Risk of burns!** The nozzle and the metal parts on the extruder become very hot. When the filament comes out of the nozzle in the form of a soft plastic thread, it is very hot (150°C to 260°C). To start the winding process, you must handle the filament in a soft state. Therefore, use protective gloves or tools such as tweezers to handle the filament in this area. The filament cools down considerably after a few centimeters on the surface, but remains very hot for a long time on the inside. Therefore, be very careful when handling the filament.

## 07.1 Heating up

Heat up the extruder by selecting Preheat in the main menu. The extruder now heats up to the preset 180°C. This temperature is an approximate starting value for PLA. If you would like to set a different preheat temperature, you can do this under Main menu - Control - Temperature - Preheat Setting. Only change the temperature once the preheat value has been reached. You can then change the temperature at any time under Main menu - Setting - Temperature. A list of empirical values for different types of plastic can be found in chapter 06.6. When the extruder has heated up, the control unit beeps twice. This is to ensure that you do not forget that the device is in operation. If the extruder has heated up but is not started for more than 30 minutes, the error message "Safety cooldown" appears. The extruder must then be restarted.

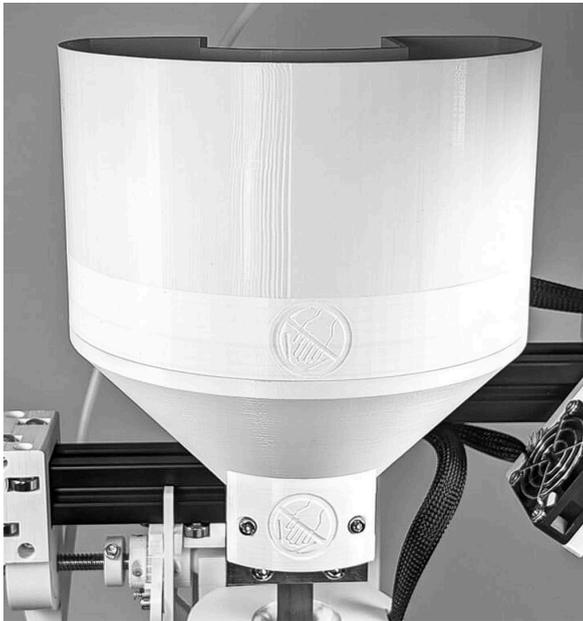
## 07.2 Filling the funnel



1. fill the funnel with plastic granulate. **Make sure that you comply with all the criteria in chapter 06.** The hopper part 1 is permanently installed on the extruder and should always be at least filled in order to achieve consistent extrusion results.



2. hopper part 2 has a kind of aperture so that the pellets flow to the feed zone in a controlled manner when processing pellets (industrial pellets). **When processing shredded 3D print waste (regrind), hopper part 2 should be removed to prevent bridging in the material.**



3 The funnel part 3 enlarges the funnel and enables a longer running time. This part is stackable so that you can add another funnel part on top. When this part is filled, you can produce at least 1 kg of filament.

## 07.3 Starting the extruder and injection molding function

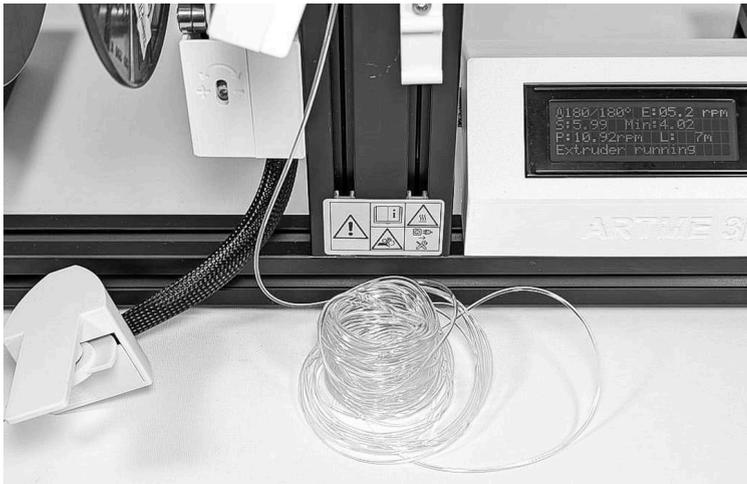
### 07.3.1 Starting the extruder for filament production:

Start the extruder motor (Main menu - START Extruder). The motor can only be switched on if the current temperature of the extruder is above 150°C to prevent damage from cold plastic (you can change this value, see chapter 15). At the factory setting, the motor starts at 7 revolutions per minute (RPM). This is a relatively slow initial value to get used to. The pull motor and the spool motor also start, so the filament spool will also rotate. You can change the extruder speed at any time (Main menu - Setting - Extruder rpm). When the extruder is running for the first time, or when the extruder screw is free of plastic, it may take a few minutes for the material to come out of the nozzle. When plastic comes out of the nozzle, the extruder still needs a moment until the pressure and temperature curve along the extruder screw are uniform. Therefore, let it run for another 2 to 4 minutes. The sensor should be removed and placed to one side to prevent damage. It is best to place a carpet pad on your work surface so that it cannot be damaged by the hot plastic.

**It must now be ensured that the extrusion runs smoothly. The soft filament winds up under the nozzle. If the extrusion is even, it will look something like this:**



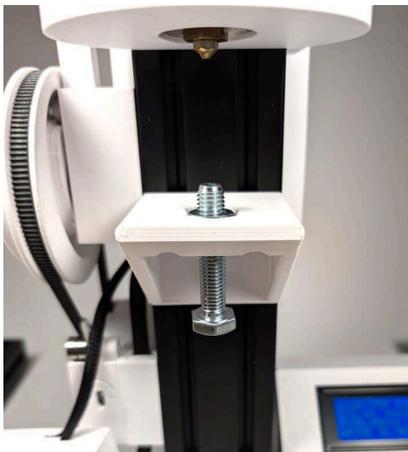
However, if the extrusion is NOT uniform, it looks something like this:



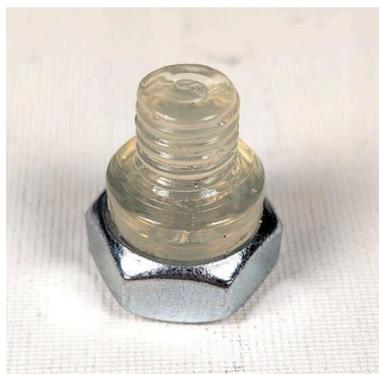
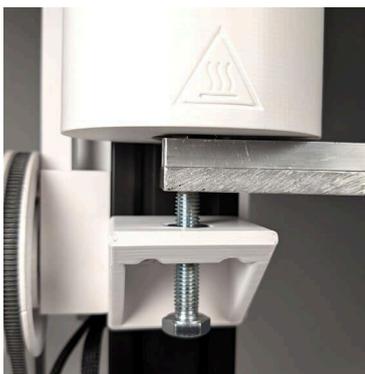
If the extrusion is uneven or other problems occur, such as blockage of the extruder screw, please refer to chapter 16.

### 07.3.2 Starting the extruder for injection molding:

The injection molding function can only be used if the current temperature of the extruder is above 150°C to prevent damage from cold plastic (you can change this value, see chapter 15). Set the desired temperature and the desired speed (Main menu - Settings - Extruder rpm). Then select the desired injection time (Main menu - Settings - Injection time). This can range from 1 to 180 seconds. Switch to the start screen. If you now press and hold the rotary knob next to the display for 2 seconds, the extruder will run for the set time.



Remove the sensor and the fan under the nozzle. You can mount the clamping bracket (component IM-A) on the sliding blocks. In bag 3 of the kit you will find a hexagon nut M10x50 and in bag 5 you will find a threaded nut M10. You can insert these into component IM-A and use them as a clamping device for the injection mold to be filled. It is advisable to warm up the mold. For the maximum extrusion quantity, you must find out at which temperature the material used is extruded fastest. Sometimes higher temperatures are necessary to generate a lot of material flow. Sometimes, however, the friction in the system is reduced at higher temperatures, so that less material comes out of the nozzle. Do not use a melt filter. Do not allow the extruder to heat up for too long without starting the extrusion, otherwise the material may degrade due to thermal stress.



# 08 Prepare filament production

## 08.1 Prepare speeds and fan position

To start the filament winding later, you need both hands and don't have much time to concentrate on other things. Therefore, there are a few things that can be preset:

1. roughly set the speed of the extruder motor and the motor of the drawing unit depending on the material. A list with empirical values depending on the type of plastic can be found in chapter 06.6. The extruder speed is set via Main menu-Settings-Extruder rpm. Avoid higher speeds (above 15 RPM) if the values for the material settings are not known. Too high a speed can cause the extruder screw to block if the settings are not suitable.
2. the speed of the pulling unit is set by turning the rotary knob on the display while the information view is shown. You can read the corresponding speed on the display under "P:". Here too, you can use the values in chapter 06.6 as a guide.
3. roughly adjust the fan speed of the fan under the nozzle. Main menu - Settings - Fan speed. Here you can also use the values in chapter 06.6 as a guide. There are two reasons for cooling the filament on the way to the rewinder. Firstly, it generally cools the filament so that it is cold enough to be wound up properly. Secondly, it cools the surface of the filament in the area of the sensor to such an extent that the sensor arm does not stick to the soft filament.

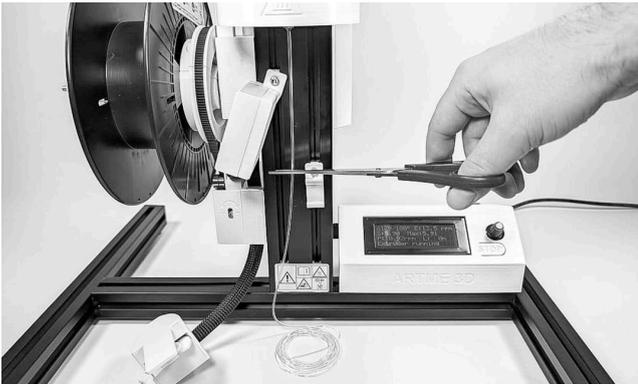


4. roughly adjust the alignment of the fan under the nozzle. **It is usually advantageous to tilt the fan under the nozzle slightly downwards. This ensures that the function of the sensor is not disturbed by the filament sticking to it. It also prevents the filament from solidifying too early and warping as a result. However, if the filament is still too soft when it arrives at the drawing unit, it may be necessary to straighten the fan under the nozzle. This adjustment is very sensitive. Use your finger to feel exactly where the airflow is coming from.**

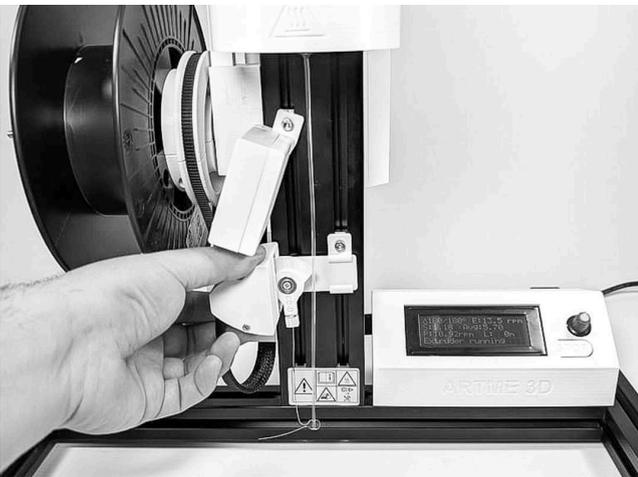


- 5 The fan next to the drawing unit can also be tilted downwards. This extends the cooling zone. However, there are also materials that solidify very quickly. In this case, too much cooling can disrupt the winding process, as the filament warps. In this case, set the fans straight.

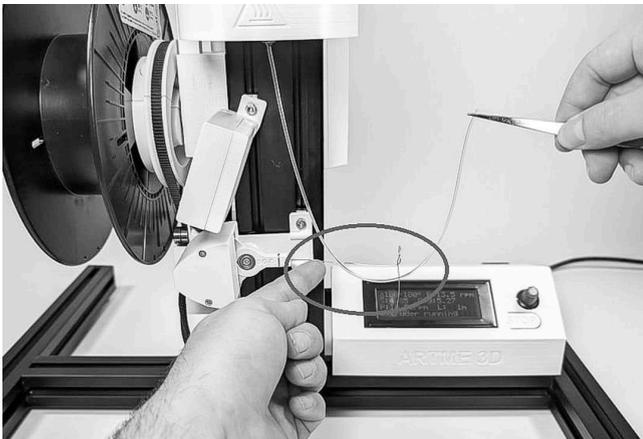
## 08.2 Preparing filament production



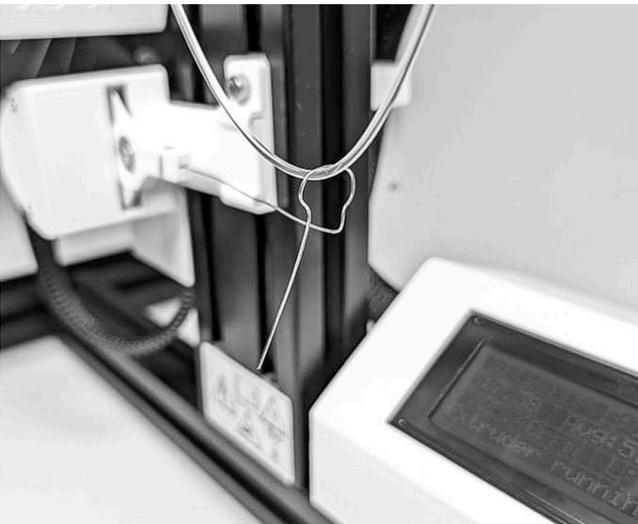
08.2.1 Cut off the still soft filament approx. 7 to 10 centimeters after the nozzle using scissors or a side cutter.



08.2.2 Reinsert the sensor into the holder by pushing it into the holder from the left.



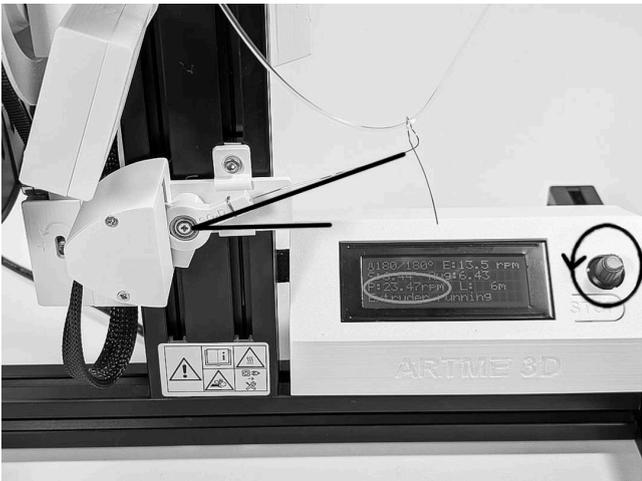
08.2.3 Guide the filament in an arc in the direction of the drawing unit and place the sensor on the filament. Make sure that the tip of the wire of the sensor rests on the filament. Pull the filament at approximately the same speed as it comes out of the nozzle, keeping the sensor approximately horizontal.



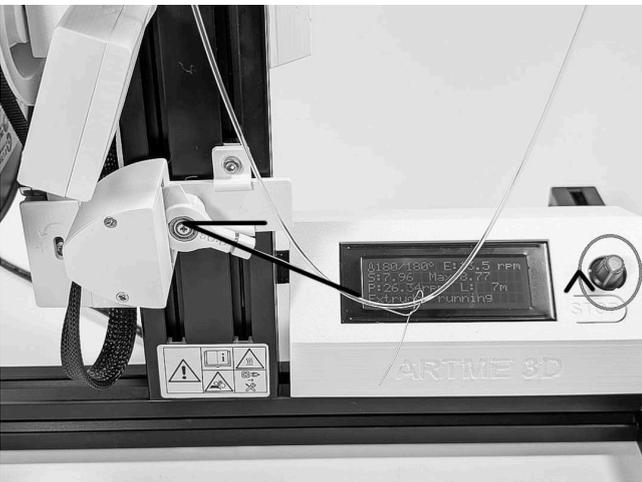
08.2.4 **If the cooling by the fan is too fast or the extrusion speed is too low, the filament may warp, making the subsequent process more difficult. In this case, read point 8 below. If the cooling is too slow, the filament can stick to the sensor. The sensor then "jumps" over the filament. In this case, increase the speed of the fan and make sure that it is tilted so that it blows onto the sensor**



08.2.5 Push the filament through the hole in the measuring device to the drawing unit. The filament should be drawn in by itself. If not, you must open the tension lever on the drawing unit slightly by hand.



08.2.6 The speed of the motor of the pulling unit can now be changed by turning the rotary knob on the display (Info view must be visible). Set the speed so that the sensor remains approximately horizontal. **If the sensor is pointing upwards (line in the second image), the speed must be lower.**



08.2.7 If the sensor is pointing downwards (line in the picture), the speed must be increased.



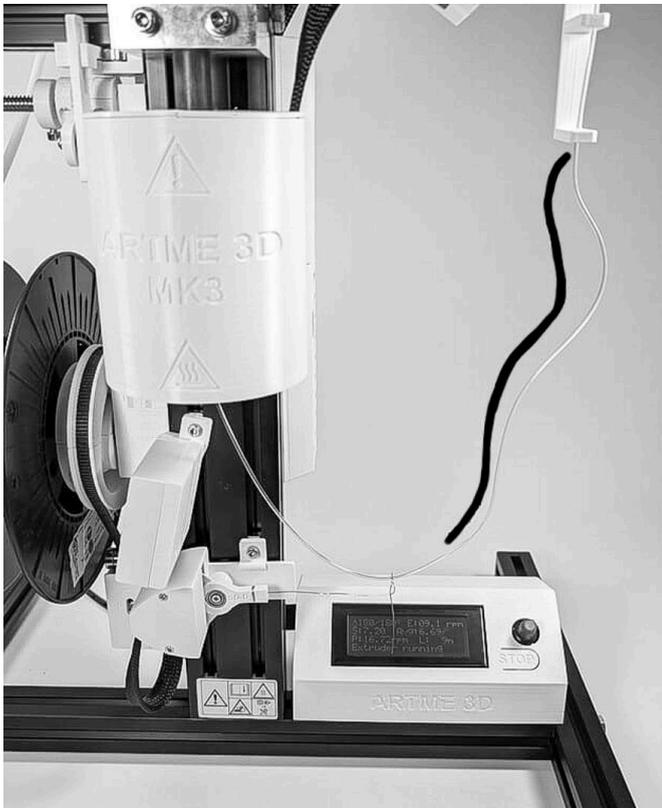
08.2.8 **If the sensor remains approximately horizontal, you can activate automatic rewinding. To do this, click on "automatic pulling" in the main menu.** The speed of the pulling motor is now regulated depending on the height of the sensor. If the sensor is lowered, the speed is increased and vice versa. This ensures that the soft filament, which runs in an arc to the pulling motor, always hangs at the same height. This keeps the dead weight and therefore the diameter of the filament uniform. With a little practice, the whole process is quite quick. The sensor can

be moved a little to the right or left in its holder so that the wire on the sensor touches the filament sheet at the lowest point.



08.2.9 The filament now runs through the PTFE tube and comes out above the spool at the filament guide. Let it run to the bottom first to give you time to make the next settings to calibrate the exact diameter.

08.2.10 You can interrupt the automatic speed control at any time (main menu/manually pulling) and control it again using the rotary knob in the information view. This is particularly necessary if you make large changes to the settings. Only restart the automatic speed control when the sensor is approximately horizontal.

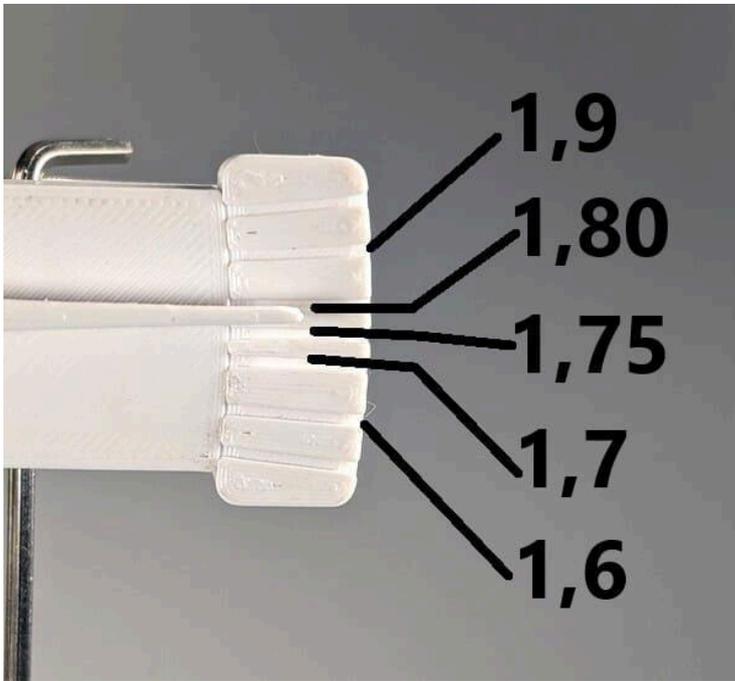


08.2.11 **If the fan cools down too quickly or if the extrusion speed is too low, the filament may twist on its way to the drawing unit. This can damage the sensor and block the motor of the drawing unit, making rewinding impossible. In this case, you have the following options:**

- Reduce the fan speed (in small steps).
  - Tilt the fan under the nozzle downwards so that it points towards the sensor and the filament, which is pulled upwards, cools down less.
  - Increase the speed of the extruder motor (in small steps).
  - to reduce the distance between the sensor and the nozzle.
  - Increase the temperature of the extruder (in small steps).
  - Clean or replace the melt filter, as it may be clogged or slipped.
  - There are some materials that are not well suited to this process as they solidify too quickly or are too brittle. These are often materials for which the extruder was not designed (HDPE, fiber-filled materials, etc.). You will have to experiment a little to see whether calibration to filament is possible.
- If it doesn't work the first time, simply try again by cutting the filament. After a bit of practice, you will be able to do this very quickly.

# 09-Calibrate filament diameter

## 09.1 Measuring the filament diameter



You can read the diameter relatively accurately on the analog display. However, check the measurement result from time to time with a high-quality caliper gauge and repeat the calibration of the analog display if necessary. See chapter 05.4.

## 09.2 Define usable filament

For example, if you set a filament diameter between 1.6 and 1.8mm (with a 1.75mm filament system), this can be processed well with standard 3D printers. If in doubt, you can increase the flow rate of the printer, for example, if the diameter is smaller than 1.75mm. Or you can enter the diameter of the filament in the slicer. However, if the diameter of the filament fluctuates greatly during production, even though the rewind is running automatically, there is something wrong with the system (granulate quality, speed too high, melt filter dirty, material unsuitable, etc.) A filament diameter of greater than 1.85 mm may cause clogging in most 3D printers. If in doubt, stay slightly below the target diameter of 1.75mm. With a little practice, however, it is quite possible to achieve this diameter. See next step.

## 09.3 Calibrating the filament diameter

If you are processing a new material without experience, this process can take some time as the system reacts quite slowly. So if you change the temperature to optimize the filament diameter, for example, wait a moment until the temperature has adjusted throughout the system. The same applies to all the options listed below.

Important to know: Plastics expand to varying degrees as they leave the nozzle. Therefore, the hole in the nozzle only roughly determines the filament diameter:

Hole sizes for 1.75mm filament:

PLA and PETG: approx. 1.7mm hole (empirical value, may vary)

ABS: approx. 1.5mm bore (empirical value, may vary)

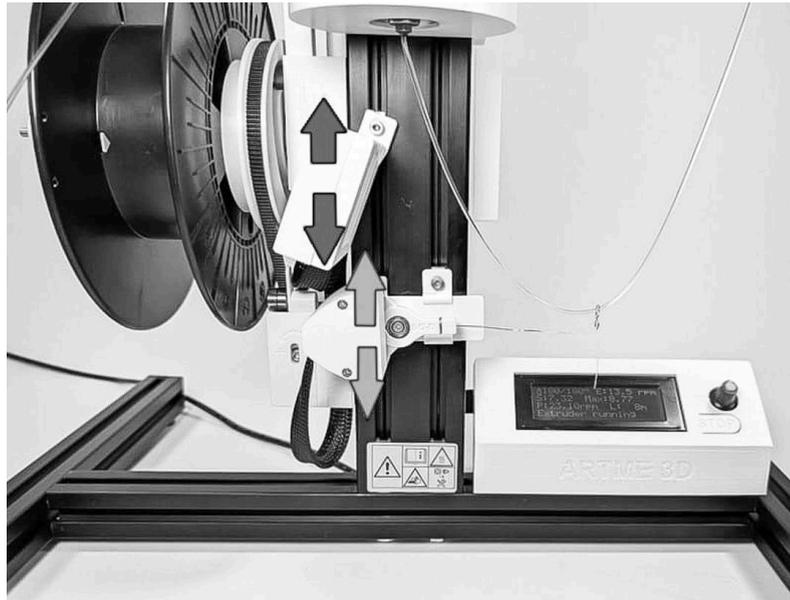
### **The following options are available to influence the filament diameter:**

1. The size of the hole in the nozzle
2. The pressure in the system as a function of speed, material and temperature.
3. The filling level of the funnel. (At least funnel part 1 should always be filled to ensure even pressure in the system)
4. The distance between the nozzle and the sensor. (a greater distance increases the weight of the filament)
5. The property of the material depending on the temperature (tough or soft)
6. The weight of the sensor.
7. The distance from the fan to the nozzle. The closer the fan is to the nozzle, the cooler the nozzle will be and the filament will cool down sooner.
8. Plastic is damaged during each melting process (degradation due to the frequency and duration of the melting processes). This can change the properties of the plastic. PLA, for example, appears to become thinner and no longer expands as much when it leaves the nozzle the more often it is melted. This reduces the diameter of the filament and requires new settings.
9. Even plastics of the same type can have different properties. This depends, for example, on the manufacturer's formulation or the age of the material.
10. Avoid draughts in the room.
11. Always dry the material before processing.

### **It is therefore advisable to use the empirical values and then proceed as follows for fine adjustment:**

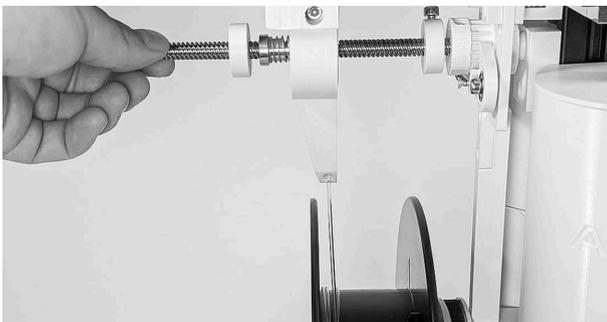
1. The hole in the nozzle can vary in size depending on the material to be processed. Only change the nozzle diameter with the aim of changing the diameter of the filament if you are NOT able to achieve this with the help of the following setting options.
2. If the filament diameter is too large, you can:
  - a. Increase the distance between the sensor and the nozzle. The weight of the filament is increased so that the filament is drawn a little thinner (arrows in the picture below).
  - b. Increase the distance from the fan to the nozzle slightly. This way, the filament is softer shortly after the nozzle and stretches a little more (arrows in the picture below).
  - c. Increase the temperature slightly. This makes the plastic softer and pulls thinner. If the plastic is still too hot when it reaches the sensor, the sensor arm may brake or bounce. In this case, increase the speed of the filament fan.
  - d. Slow down the speed of the extruder motor. This reduces the pressure in the system and the filament expands less when it leaves the nozzle.
  - e. Reduce the fan speed. The filament then cools down a little later and has more time to be drawn by its own weight.
  - f. Attach an additional small weight (e.g. washer M5) to the sensor, this pulls the filament a little longer.
3. If the filament diameter is too small, you can therefore:
  - a. Reduce the distance between the sensor and the nozzle (arrows in the picture on the next page).
  - b. Reduce the distance between the fan and nozzle (arrows in the picture on the next page).
  - c. Reduce the temperature slightly.
  - d. Increase the speed.
  - e. Increase the fan speed.
  - f. Reduce weight on the sensor.
4. **Remember to only make changes in small steps and to give the system time after each change until the effect is stable.**

5. Make a note of the setting values and save the settings if required. (Main menu - Control - Save Settings)

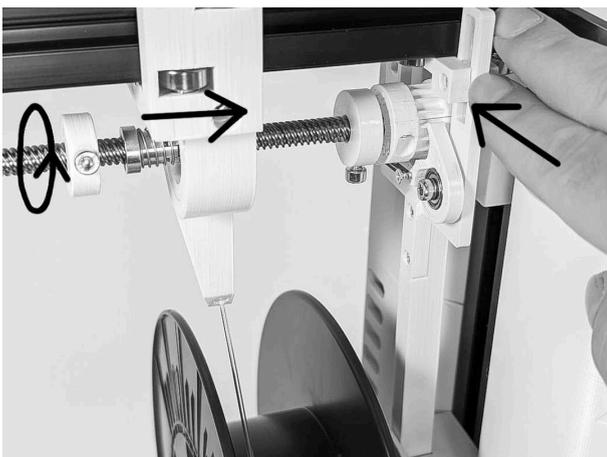


## 10-Spool filament

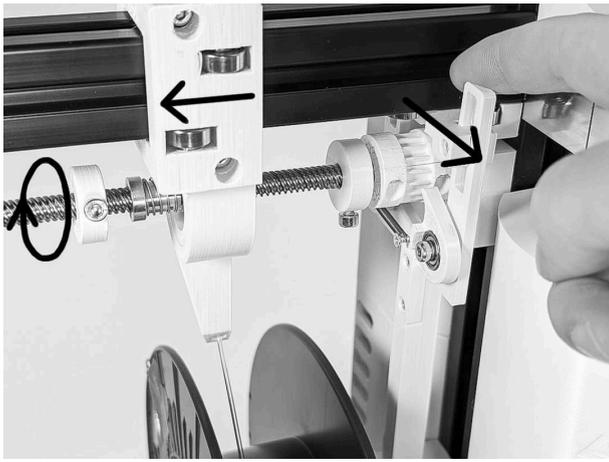
### 10.1 Moving the filament guide



10.1.1 The filament guide is moved by turning the threaded spindle. This is necessary to be able to start the winding process correctly.



10.1.2 To move the filament guide to the right, press the mechanism by hand and turn the threaded spindle counterclockwise.



10.1.3 To move the filament guide to the left, pull the mechanism by hand and turn the threaded spindle clockwise.

## 10.2 Setting the direction reversal

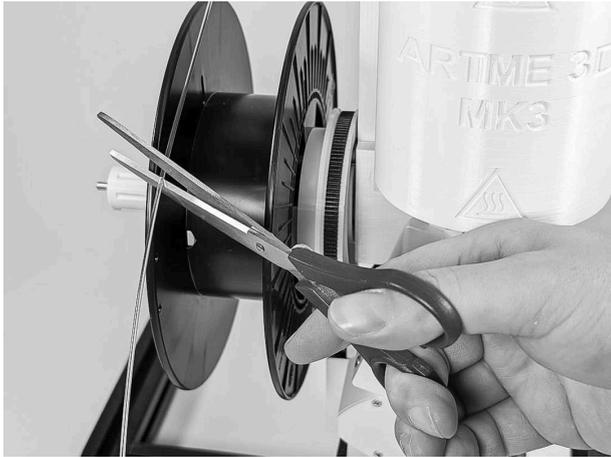


10.2.1 Loosen the cylinder screws in the FG-N component and select the position so that the filament can be moved from the guide all the way to the left side of the spool. Then tighten the screw again.



10.2.2 Loosen the cylinder screws in the FG-N component and select the position so that the filament can be moved from the guide all the way to the right-hand side of the spool. Then tighten the screw again.

## 10.3 Start rewinding



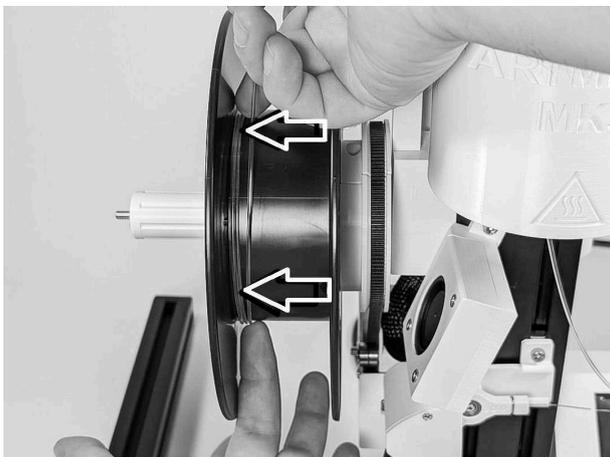
10.3.1 Cut the filament above the spool.



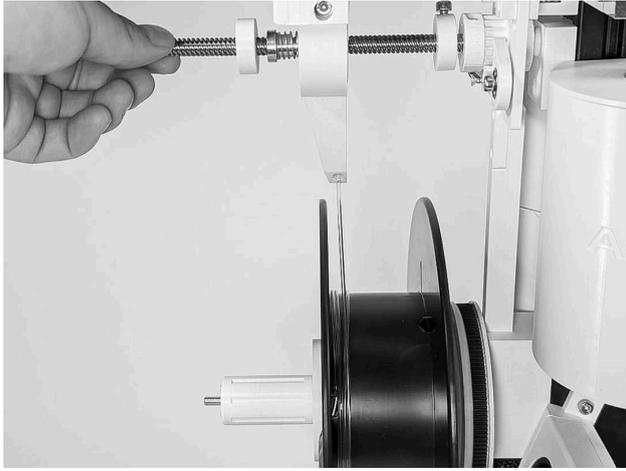
10.3.2 The filament is then threaded into the opening at the bottom of the spool. To do this, turn the empty spool by hand into a position where you can see the opening. Push the filament through it.



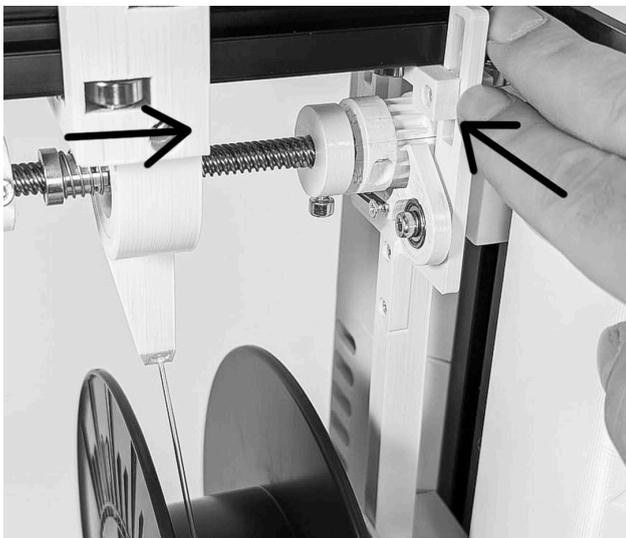
10.3.3 The filament is bent over on the outside of the spool and secured with adhesive tape. With a little practice and well-dried material, you can also do this without adhesive tape by bending the filament. Make sure that the filament remains reasonably taut. The protruding end of the filament should be cut off.



10.3.4 Move the first windings to the left-hand side.



10.3.5 Correct the position of the filament guide.



10.3.6 Finally, make sure that the mechanism is set so that the filament guide moves in the left-hand direction.



10.3.7 It can happen that a hook is twisted. It is important that the hook straightens up again.



10.3.8 To do this, you can move the mechanism back and forth and/or turn the threaded spindle slightly.

10.3.9 Once winding has started successfully, you can reset the filament length counter (Main menu-Clear statistics). The extruder switches off automatically once a preset filament length has been reached. Before it can be restarted, the device should be switched off once and then switched on again. The default setting is 200000 mm (200m), which corresponds to approximately 570g (with 1.75mm filament). You can set the default setting for switching off. (Main menu - Settings - L cutoff). The value of the cut-off length is displayed in millimeters (mm). You can read the filament length produced on the information view of the display under "L:". This value is displayed in meters (m). You can reset or pause the display (Main menu - Clear statistics or Pause statistics).

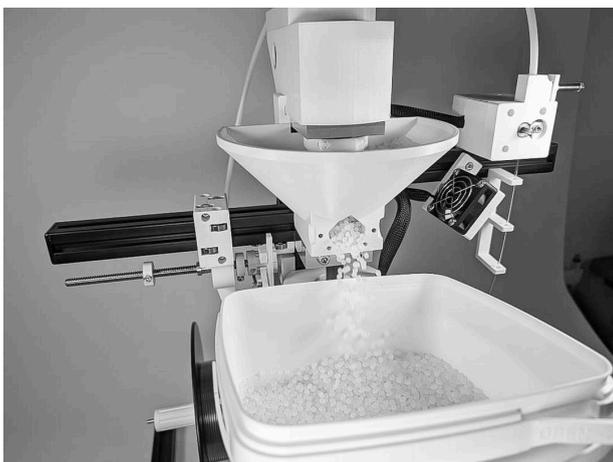
## 11-Material change

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### 11.1 Emptying the funnel



11.1.1 If it is necessary to empty the funnel, remove the two cylinder screws on the funnel spout.



11.1.2 Then hold a container under the spout and pull out the funnel spout. Pellets will trickle out by themselves. If you want to empty the regrind, it may be necessary to help with your hand or a tool, as regrind does not trickle out well.



11.1.3 Do not forget to close the funnel again.

## 11.2 Change of material

There are several options for changing the type of plastic to be processed:

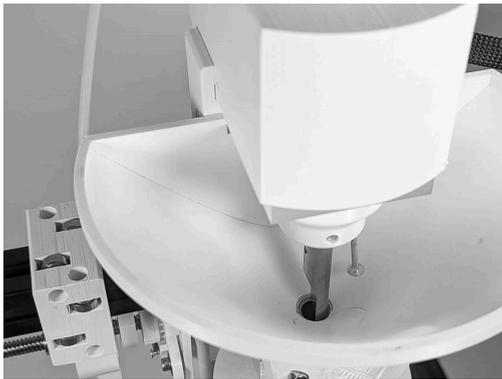
1. Fill in new material during operation and allow the extruder to run until the screw, extruder tube and nozzle have cleaned themselves. Depending on the material and the temperature requirements of the material, this can take 10 to 40 minutes. This is only possible if the materials have a processing temperature that overlaps, e.g. PLA, PETG and ABS.
2. If you change from a plastic with a high processing temperature to a plastic with a lower processing temperature (e.g. from PETG to PLA), it is possible that residues of the old plastic will remain at various points in the system. This is particularly the case in the narrowing area of the nozzle. This can lead to contaminated filament. It may therefore be necessary to clean the area of the nozzle and remove the extruder screw in order to clean the feed area. See chapter 12. Also clean the area of the thread in the extruder tube, see chapter 14.
3. However, build-up can also occur in the feed area of the extruder screw. This can lead to uneven extrusion. The extruder screw should then be removed and cleaned. See chapter 12.
4. If the processing temperatures of the plastics to be changed are far apart, it may be necessary to work with cleaning pellets. This makes it possible to change materials without removing the extruder screw. However, these are very expensive and only suitable for certain types of plastic.

## 12-Dismantle and clean the extruder screw

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### 12.1 Gearbox disassembly for version MK3S

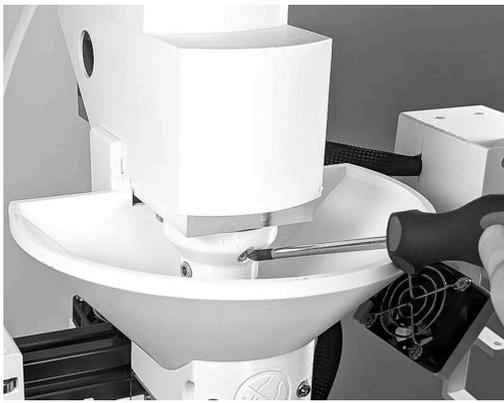
(for version MK3S+ go to the following chapter)



12.1.1 Remove the material from the hopper and first allow the extruder to run empty as far as possible when heated.



12.1.2 Even if hardly anything comes out of the nozzle, let the extruder run for a few more minutes. It is important that as little plastic as possible sticks to the screw.



12.1.3 Stop the motor so that the small clamping screw is pointing forwards. Then loosen it. Half a turn is sufficient.



12.4 Loosen the clamp on the left side of the extruder and remove the clamp completely.



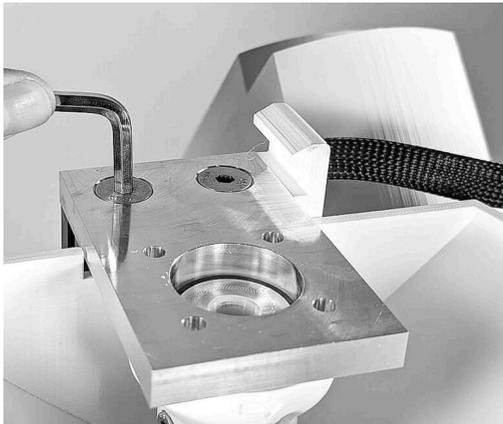
12.5 Turn the gearbox slightly to the left and then pull it out at the top.



12.7 Insert the gearbox into the holder provided.



12.9 The feather key may now be in the clutch. This can be removed with the supplied screwdriver, as it is slightly magnetic. If not, rub a magnet against it and it will become magnetic. **Take good care of the feather key. You can insert this into the slot provided on the analog measuring device.**



12.10 Loosen the screws of the motor bracket.



12.11 Remove the motor bracket. Now continue with chapter 12.3. **After replacing or cleaning the extruder screw, install in reverse order.**

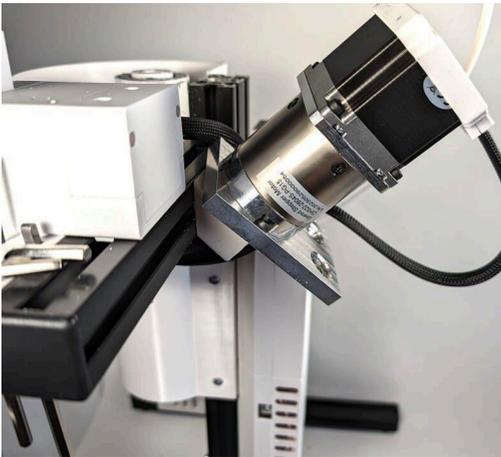
## 12.2 Gearbox disassembly for version MK3S+



12.2.1 Loosen the screws of the motor bracket and lay it on its side.



12.2.2 Pull the motor out upwards. Pay attention to the feather key. It often gets stuck on the motor shaft. **If it comes loose and falls off, take good care of it. You can insert it into the slot provided on the analog measuring device.**



12.2.3 You can insert the motor into the holder provided from the rear. **After replacing or cleaning the extruder screw, the installation is carried out in reverse order.**

## 12.3 Replacing/cleaning the extruder screw



12.3.1 The extruder screw can now be gripped at the coupling and pulled out/unscrewed upwards. In the event of problems, this may require some force. If in doubt, heat the extruder further so that the plastic becomes softer. **Caution There is a high risk of burns and injury from sharp edges during the entire process. Wear protective gloves and only touch the parts where they are not heated.**



12.3.2 Turn the clutch so that the thrust bearing can be removed. Lay it on its side. Make sure that no dirt or dust gets into the bearing.



12.3.3 Hold the extruder screw by the cold end. The plastic can now be removed with tweezers or pliers. To do this, wait a short time until the screw cools down slightly so that the plastic becomes tough. The plastic can then usually be removed in one piece. Start with the cold shaft. The tip of the screw cools down last. It can be helpful to blow a little air onto the plastic with your mouth to make it tougher more quickly in the desired areas. If there are charred areas or other adhesions, it may be necessary to polish the screw again.



12.3.4 Do not forget to clean the edges of the flanks.



12.3.5 Reinsert the thrust bearing. Take this opportunity to check whether there is sufficient lubrication. If necessary, lubricate the bearing with the silicone grease supplied.



12.3.6 Push the extruder screw into the pipe. **If the extruder screw cannot be pushed in because plastic is still stuck to the extruder screw, which has now solidified, you can preheat the extruder screw with a hot air gun. Install the gearbox in reverse order to chapters 12.1 and 12.2.**

# 13 Clean / replace melt filter

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## 13.1 Cleaning the melt filter

The melt filter has a relatively small surface area, so the filter should be cleaned regularly. Regrind from 3D printing waste often contains significantly more dust and particles, which can clog the filter quite quickly. It is therefore very important that you pay close attention to cleanliness when collecting 3D printing waste. See the [material guide](#) in the documentation. **The filter only ensures that the material can be printed with a 3D printer with a 0.4 mm nozzle. The filter is not suitable for filtering contaminated material in general. Contaminated material should not be processed.**

**If you want to buy new filter material, look for the following material:**

- Stainless steel wire mesh/filter mesh or stainless steel mesh.
- "Mesh Size 50" (this corresponds to a mesh width (MW) of 0.3mm).
- I can't say where to buy as the material is labeled and available differently in each country. But an internet search should lead you to a supplier.

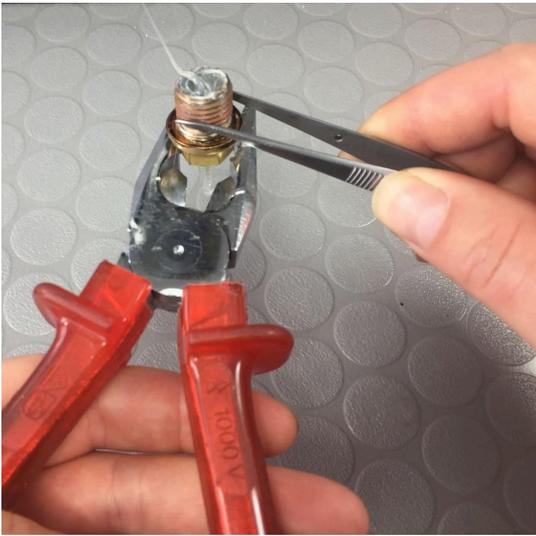
**There is a risk of burns when cleaning the filter, use gloves and/or tools so that you do not touch the hot parts.** To clean the filter, proceed as follows:

13.1.1 Heat up the extruder. Then unscrew the nozzle. The corresponding 13 mm socket wrench is included in the kit.



13.1.2 Remove the nozzle from the socket wrench using tweezers.





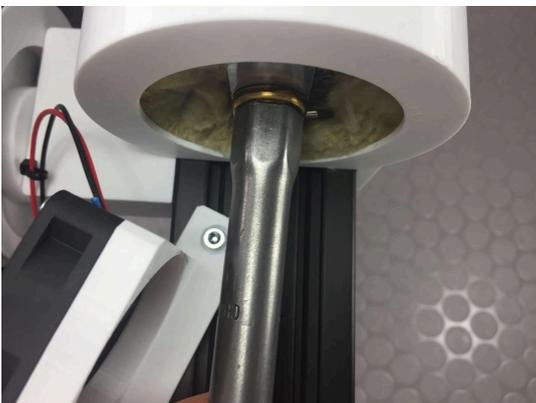
Place the nozzle in a pair of pliers to hold it.



13.1.3 Then use the tweezers to remove the plastic from the melt filter. Dirt particles usually detach from the filter and are removed with the plastic. Make sure that the melt filter does not come loose.



13.1.4 Press the filter into the correct position again before refitting the nozzle.



13.1.5 Screw the nozzle back into the extruder tube. Wait 1 minute before restarting the extruder so that the melt filter can heat up again.

## 13.2 Replacing the melt filter

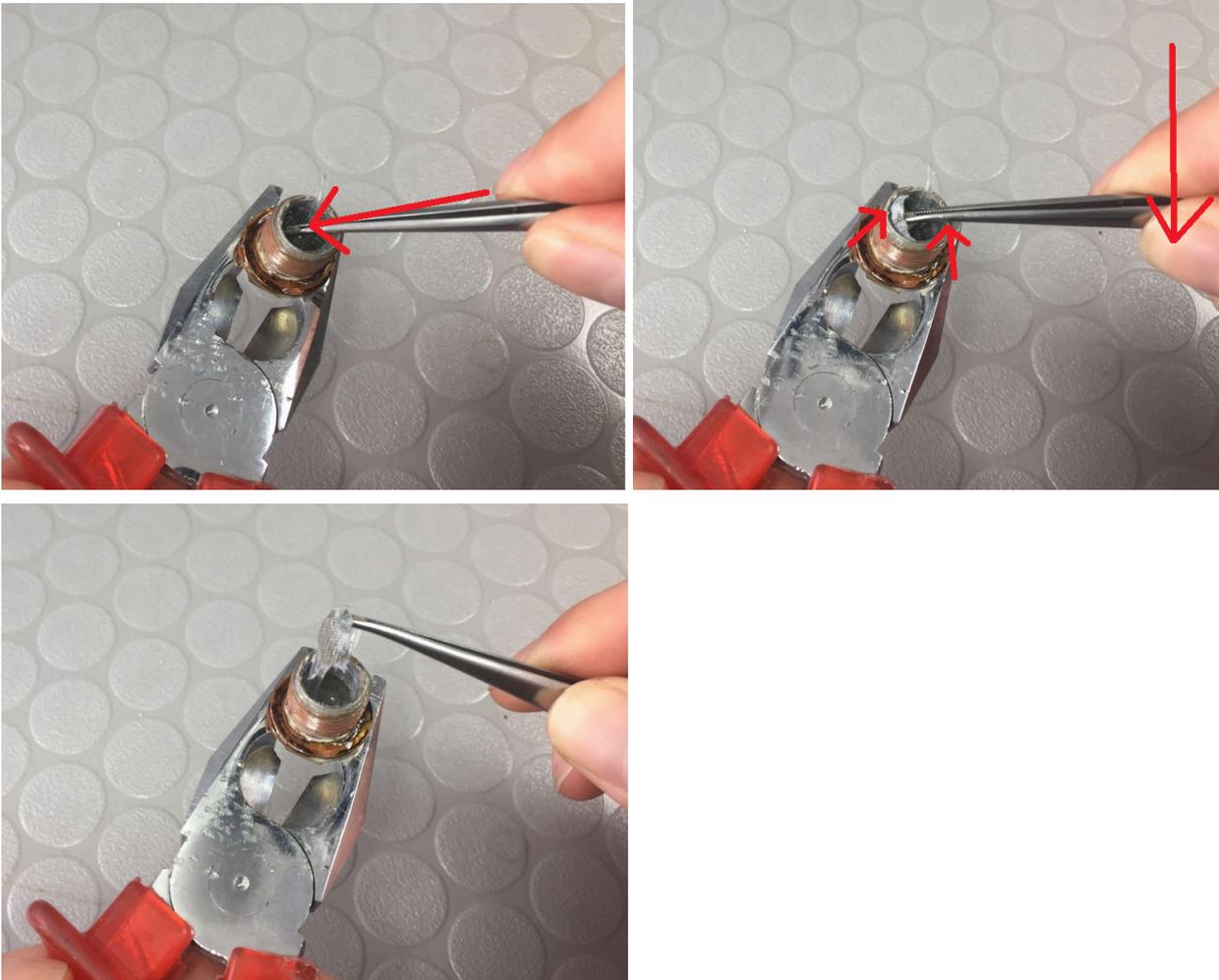
If the filter is damaged or is removed during a material change, it may be necessary to replace it. There is a risk of burns when replacing the filter, use gloves and/or tools so that you do not touch the hot parts. The melt filter consists of a stainless steel wire mesh with a mesh size of 0.3 mm (mesh 50).

**If you want to buy new filter material, look for the following material:**

- Stainless steel wire mesh/filter mesh or stainless steel mesh.
- "Mesh Size 50" (this corresponds to a mesh size (MW) of 0.3mm).
- I can't say where to buy as the material is labeled and available differently in each country. But an internet search should lead you to a supplier.

Proceed as follows:

1. remove the nozzle as described in the previous step.
2. the filter insert can now be removed. To do this, use tweezers or a thicker needle and **lever** out the wire mesh.



3. then allow the nozzle to cool for a few seconds until the plastic inside becomes tough. Then you can pull out the plastic with needle-nose pliers, for example. When the plastic is at the right temperature, you can remove almost all of it in one piece. However, it is important that the upper edge is free of plastic so that a new filter can be inserted.



4. the nozzle can now be fitted with a new melt filter and reinstalled. **Use fresh Teflon tape to seal the nozzle.**

When you turn the nozzle back into the preheated pipe, please wait approx. 1 minute before starting the extruder motor. If the nozzle is still too cold, the melt filter inside the nozzle may be deformed.

## 14-Clean nozzle and thread

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### 14.1 Cleaning the nozzle

Deposits may form in the nozzle area when changing materials. This is particularly the case if you change from a material with a higher processing temperature to a material with a lower processing temperature. For example, from PETG to PLA. As the plastic with a higher processing temperature flows more slowly than the plastic with a lower processing temperature, deposits will form.



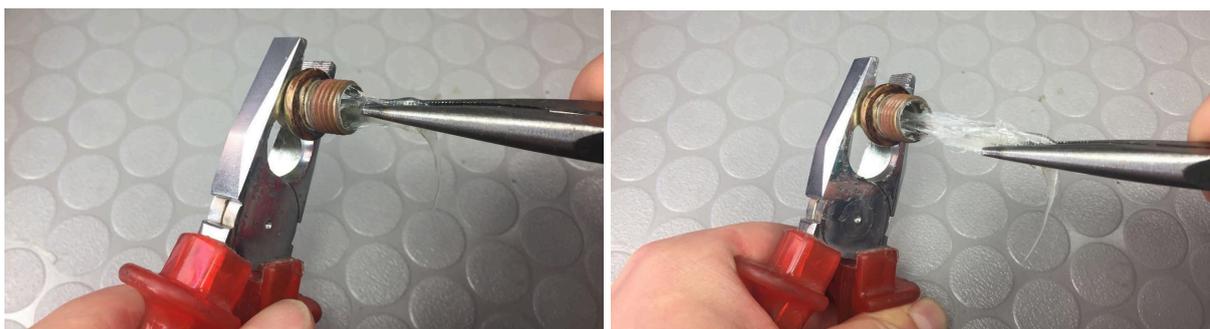
To clean the nozzle, proceed as follows. Using the example of changing from PETG to PLA:

1. Remove the melt filter. See chapter 15.2. Then reinstall the nozzle and run the extruder at the processing temperature of PETG (or slightly higher, approx. 215°C) while PLA is in the hopper. Select a high extruder speed of approx. 20 to 23 RPM. This creates pressure in the nozzle and the deposits are pressed out. Let the extruder run like this for a few minutes.
2. Stop the extruder and set it to a fairly low temperature. Using PLA as an example, set it to approx. 155°C (in preparation for the next chapter). Then remove the nozzle again. See chapter 15.2 again.

Using needle-nose pliers or similar, squeeze the soft plastic a little and allow the nozzle to cool briefly. You can use the pliers at this point when the plastic becomes colder and tougher.



3. Use the pliers to slowly pull out the plastic while it cools down. Make sure that it does not tear off and remains in one piece. With a little practice, you can get it all out in one piece. You need to hit the right temperature and some force may be needed when pulling. Sometimes it helps to blow a little air onto the plastic with your mouth. This makes it harder at the points that help you pull it out.



4. The nozzle should now be clean. If not, you can repeat the process. However, the nozzle is not yet installed. Now continue with chapter 14.2.



## 14.2 Cleaning the thread in the pipe

1. Set the extruder to a fairly low temperature. For PLA, for example, to approx. 155°C. When this temperature is reached, start the extruder again at a fairly slow speed (approx. 7 RPM).



2. If the area of the thread is filled with plastic, you can, for example, insert a small screwdriver into the hot pipe and rub in a circular motion along the thread and pull out the plastic inside. The temperature must not be too high. The plastic should be more viscous than liquid. Caution: When the extruder screw is rotating, a tool inserted into the pipe can become jammed and damage the extruder screw and the pipe. Therefore, do not push the tool too deeply into the pipe, but only remain in the area of the thread. The deposits in the thread will stick to the plastic. Then stop the extruder again.



3. The nozzle can now be fitted with a new melt filter and reinstalled. When you turn the nozzle back into the heated pipe, please wait approx. 1 minute before starting the extruder motor. If the nozzle is still too cold, the melt filter inside the nozzle may be deformed.

# 15-Display messages and errors

English message		Cause	Solution
E: Cold rpm		If the temperature is below 150°C, the extruder motor cannot be switched on. This is to prevent damage to the drive or the extruder screw	<ol style="list-style-type: none"> <li>1. temperature must be above 150°C.</li> <li>2. if a lower temperature is required, then make a change in the firmware:               <ol style="list-style-type: none"> <li>a) In the configurations.h file, change the value for "EXTRUDE_MINTEMP".</li> <li>b) In the ultralcs.cpp file, change the value 150 in lines 526, 718, 1025 and 1078.</li> </ol> </li> </ol>
Safety Cooldown		Cools down after 30 minutes without using the extruder motor	If the extruder is not in use, switch off the heating. Main menu - Cooldown
Mintemp		If temperature too low or thermistor defective	<ol style="list-style-type: none"> <li>1. operating temperature of the extruder must be above 5°C.</li> <li>2. replace the thermistor.</li> </ol>
Maxtemp		If temperature too high or thermistor defective	<ol style="list-style-type: none"> <li>1. the operating temperature of the extruder must be below 260°C.</li> <li>2. replace thermistor...</li> </ol>
Heating Error		If the heater heats for a long time but does not reach the set temperature, it may just be incorrect operation. Or thermistor or heater defective.	<ol style="list-style-type: none"> <li>1. when heating up for the first time after switching on the extruder: Do not change the temperature until the heating temperature has been reached. And then only in small steps.</li> <li>2. replace the thermistor.</li> <li>3. replace the heater.</li> </ol>
Sensor Error		If 30 seconds outside the min/max value of the sensor. Due to uneven extrusion or sensor error.	<ol style="list-style-type: none"> <li>1. ensure uniform extrusion. See chapter 16.1.</li> <li>2. check the cooling of the filament under the nozzle. If it is too weak, the filament will stick to the sensor.</li> <li>3. replace the fan under the nozzle.</li> <li>3. replace the sensor.</li> </ol>
Extrusion complete		In automatic mode: When the set filament length is reached.	Set the filament length.
E: Off rpm		If jumper on electronics is missing or a switch is connected that switches off the extruder motor.	Pin D3 on the MKS GEN L must be connected to GND.

# 16-Problem solutions

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If the extruder is not working properly, many people tend to spend hours experimenting. I don't recommend that. If the extrusion isn't running well, there is a specific reason that often can't be fixed simply with temperature changes or speed changes. Below are the main reasons for common problems to get everything running quickly and easily:

## 16.1 Extrusion not uniform or no extrusion

16.1.1 Grain size is the most common problem. Especially with PLA regrind. As described in Chapter 06, thin, flat and elongated particles are sometimes produced when 3D printed parts are shredded. They slip through a sieve because they are so narrow. However, because they are significantly longer than 7 mm, they can temporarily or completely block the feed zone of the extruder, as the particles rotate in a circle at this point and do not fall directly into the extruder screw. Here it is important that the material is well sieved. Use a sieve with round holes (approx. 4.5 to 5mm diameter) and only sieve small portions at a time. It can also help if you file the grooves in the pipe slightly larger for this specific problem. This is possible with a small, square key file. But be careful not to file too deep or too large, otherwise this can have a negative effect on the function with other materials. The picture on the left shows the grooves in their original state. The right-hand picture shows grooves that have been filed slightly larger. These are only filed larger in the first few millimeters of the tube.



16.1.2 However, the grain size can cause problems not only with regrind, but also with pellets. Pellets must therefore also be sieved, if the grain is too large, the feed zone will be blocked. See chapter 06. I have already experienced myself that the material runs well for days and then a pellet grain appears that is significantly larger than 5 mm.



16.1.3 Bridging occurs in the hopper and no more material trickles out even though the hopper is full. This is particularly possible with PLA regrind with a small grain size. There is a high powder content and small sharp-edged particles in the regrind. This causes the material to compact over time until it no longer trickles. To do this, install both agitator options (screw and pressure part ED-A.2). See assembly instructions. You can also sieve out the powder content in the ground material by using a sieve with very small holes. It can also help to coat or paint the inside of the hopper to get a smoother surface. In general, it also helps if you do not fill the hopper too full, refill it regularly and stir the material in the process.

16.1.4 Check whether the melt filter in the nozzle is clogged or has become deformed and has been pressed towards the nozzle tip. Both can lead to fluctuations in the extrusion output. You can find out how to remove the filter in chapter 13.

16.1.5 The extruder screw may have build-up in the feed zone, which can lead to fluctuations in the extrusion performance. This can occur after a long period of use or if the material is changed frequently. Especially when changing from a material with a higher processing temperature such as PETG to a material such as PLA with a lower processing temperature. These build-ups can also occur if the processing temperature is too high for the material in question. The extruder screw must then be cleaned. See chapter 12.

16.1.6 Check the material quality. The material must be prepared as described in chapter 06 (drying, pure, clean, etc.). Caution: Unfortunately, Precious Plastic shredders (or similar shredders) often have metal abrasion in the regrind, which often clogs the filter very quickly. An emergency solution is to produce filament without the melt filter and then print the filament with a 0.8 mm nozzle in the printer. Or you can use the material for injection molding applications, see chapter 07.3.

16.1.7 Make sure that the extruder screw is far enough into the pipe. The flat surface of the screw in the feed area must extend into the pipe. If the screw is not far enough into the pipe, material will be jammed, rotated or sheared off at the inlet to the pipe. This leads to fluctuations in the extrusion line

16.1.8 There may also be materials that are not designed for processing in such a small extruder. In this case, processing is simply not possible.

## 16.2 Blocking of the extruder screw

If the extruder screw jams, the stepper motor of the extruder drive loses steps and makes jerky movements with a noticeable noise. This is not bad at first, but should not last long. The current limitation of the stepper motor serves as overload protection. If the extruder screw jams, first check the following steps:

16.2.1 Check whether the melt filter in the nozzle is clogged or has become deformed and has been pressed towards the nozzle tip. Both require an increased torque of the extruder screw and can lead to the motor blocking. You can find out how to remove the filter in chapter 13.

16.2.2 Check the material quality and the settings used. If the speed is too high and/or the temperature is too low, this can also block the motor. Use the empirical values in chapter 06.6 as a guide, although there may be deviations in your system as you may be using different plastics or the temperature sensor may indicate slight deviations, etc. Temperature differences of up to  $\pm 15^{\circ}\text{C}$  and speed differences of up to  $\pm 7$  RPM can occur. Plastics from different manufacturers and for different applications (e.g. injection molding) can have different processing temperatures, even if they have the same name (e.g. PLA). The shape of the regrind can also have a major influence on the settings. For example, if you process the same material once in powder form and once in granulate form, the settings will be different. Decide on a material and find the right settings. Then make a note of the settings and how you produced the ground material. The same conditions must be created, then the next time you process the material, everything will go very quickly. Only then try to find the settings for the next material you want to process.

16.2.3 Check the alignment of the extruder tube. It must be aligned straight, see assembly instructions chapter 02. If the tube is no longer aligned straight to the axis of the motor due to a modification or replacement of the parts, the extruder screw will be tilted. This can cause the motor to jam during operation.

16.2.4 Make sure that the extruder screw is far enough into the pipe. The flat surface of the screw in the feed area must extend into the pipe. If the screw is not far enough into the pipe, material will be jammed, rotated or sheared off at the entrance to the pipe.

16.2.5 Check that you are using the correct extruder screw. The high-compression extruder screw has two markings on the shaft and is designed for processing shredded 3D printer waste with a high air content. However, if the regrind is very fine or small-grained, the low-compression extruder screw may be necessary. The low-compression extruder screw has one mark on the shaft and is designed for processing pellet-shaped plastics and very fine or small-grain regrind. Since December 23, 2025, the new extruder screw version V2 has been available, which is suitable for more materials. Instead of round marks, this version has oval marks on the shaft. Please contact us if you have any questions.

16.2.6 Check the condition of the axial bearing in the coupling between the extruder screw and the motor. It must be sufficiently lubricated. If it runs dry, it can brake and block the motor. Therefore, grease it regularly, especially during continuous operation. If it has run dry, remove the bearing, clean it, and re-grease it.

16.2.7 Check the motor current of the stepper motor. The motor current is set on the external stepper motor driver using small dip switches. An opening in the housing of the electronics is provided for this purpose. The following options are available:

- It looks as if the correct setting has been selected, but a dip switch is not pressed all the way down or up. If this is the case, there is no contact and malfunctions may occur. Check the correct switch position.
- If an incorrect (too low) setting is selected here, the motor may stall for no reason. Check the [assembly instructions](#) for this. The switch position should be Dipswitch 1: off, Dipswitch 2: on, Dipswitch 3 off.

- Depending on the material, it may also be necessary to increase the current. This can be the case especially with tough materials such as PLA+ or PETG, or with small/thin pellets. To increase the motor current, proceed as follows:
  - Open the electronics housing on the back of the extruder.
  - You will find small DIP switches on the external stepper motor driver. Switches 1, 2, and 3 are now set. (This setting only applies to the "DM332T" stepper motor driver used in the kit).
  - The motor current is limited to 2.5 amps in the factory setting. For 2.9 amps, set switch 1 to "on," switch 2 to "off," and switch 3 to "off." For 3.2 amps, set switch 1 to "off," switch 2 to "off," and switch 3 to "off." Caution: Only the low-compression extruder screw (one mark on the shaft) may be used up to the maximum motor current. The high-compression extruder screw (two marks on the shaft) may be damaged in the event of a fault if the current is increased to over 2.5A. ARTME 3D® accepts no liability in this regard.
- The stepper motor may then need to be cooled. However, operating temperatures of around 60 to 70°C are generally not a problem for the motor. Caution: Risk of burns. Lubricant may also leak out.

16.2.8 Check the grooves in the extruder tube and the roughness of the inner surface of the extruder tube. When the extruder is new, the grooves may still be quite "sharp-edged" and the inner surface of the tube somewhat rough. This can lead to problems with very tough materials such as PETG. The pellets are then conveyed "too strongly" in the feed zone, which leads to too much pressure in the compression zone. This can cause the screw to block. After prolonged operation, the grooves may round off a little and the inner surface may grind down a little so that the problem with PETG disappears. If in doubt, you can grind or polish the inner surface of the extruder tube. But be careful, this can lead to negative effects with other materials.

16.2.9 Check that the heating element is correctly mounted on the extruder tube. If the heat conduction is poor, the pipe may cool down too much during operation without you noticing.

16.2.10 If these points do not lead to success, it cannot be ruled out that defective electronics are causing the motor to lose steps. You can check this by removing the motor and allowing it to rotate without the extruder screw. If the motor then also stalls, the electronics are the problem. In this case, please contact me. ([www.artme-3d.de/contact](http://www.artme-3d.de/contact))

16.2.11 If this assistance is generally unsuccessful, please contact me. ([www.artme-3d.de/contact](http://www.artme-3d.de/contact))

## 16.3 Very frequent clogging of the melt filter

The melt filter used ensures that the filament produced can be printed on a printer with a 0.4 mm nozzle. It is **not** intended to clean contaminated plastic regrind in general, as is the case with industrial extruders. The material used **must be and remain clean**. Subsequent washing often does not help. If there is a dirt particle in the melt, it will be caught by the melt filter. If the melt filter gets dirty often or very quickly, please check the following options:

16.3.1 Store ground food very carefully. Use containers with lids so that no dust or other particles can get into the regrind.

16.3.2 Adhesive residues must be completely removed.

16.3.3 The regrind must be unmixed. If you are processing regrind made of PLA, for example, the processing temperature is so low that small particles of PETG, ASA or ABS, for example, can clog the filter. If there are two to three grains of a different type of plastic in the regrind, this can lead to problems.

16.3.4 It can happen that the shredder used produces small metal chips or other debris, which then ends up in the ground material. This also quickly clogs the filter. Therefore, adjust the blade gap dimensions precisely if necessary or use a fine sieve. All particles that are smaller than 1 to 0.5 mm, for example, should not be fed into the extruder.

16.3.5 If you store regrind in a container and pour material from this container into the extruder, you should not pour the last residue that collects at the bottom of the container into the extruder. This usually contains a lot of dust and dirt, such as metal abrasion, which will quickly clog the filter.

16.3.6 If you want to buy additional filter material, search the Internet for:

"Stainless steel wire mesh with a mesh size of 0.3mm (Mesh 50) and a wire thickness of 0.2mm." The mesh size is often specified in the unit "mesh". The mesh width of 0.3 mm corresponds to mesh 50. You can find this on Ebay, Amazon or local metal companies. However, it is best to enter these terms into a search engine of your choice first. If you use a filter with a larger mesh size, the protection against clogging of a 0.4 mm printer nozzle is no longer given. If you use one with a smaller mesh size, the filter is not stable enough and will be bent and pushed towards the nozzle tip, which will cause problems.

## 16.4 The filament warps

16.4.1 Do not tilt the fan under the pulling unit downwards, but set it straight to achieve less cooling distance.

16.4.2 Reduce the speed of the fan under the nozzle and/or tilt it downwards at an angle to reduce the cooling distance.

16.4.3 Increase the extrusion speed.

16.4.4 Only use suitable materials. The filament calibration of this system is designed for common 3D printer materials such as PLA, ABS, ASA, PETG. The extrusion of technical plastics such as nylon, PA, PS, etc. is often possible, but calibration to filament is not. This is because these plastics have different viscosities and properties or solidify very quickly after leaving the die. This is where the calibration and winding of this system reaches its limits. Therefore, the processing of these materials cannot currently be guaranteed.

## 16.5 The sensor jumps or sticks to the filament

16.5.1 Increase the speed of the fan under the nozzle.

16.5.2 Align the fan under the nozzle very precisely so that the air flow hits the wire from the sensor. Feel the air flow with a finger and check whether the air flow reaches the tip of the sensor.

16.5.3 Tilt the fan under the drawing unit all the way down.

16.5.4 Slow down the extrusion speed.

16.5.5 Bubbles in the filament due to insufficient drying.

16.5.6 Impurities in the filament.

## 16.6 The motor of the spool drive stalls

16.6.1 Belt tension too high. Reduce the belt tension until only a slight pull can be felt when holding the reel by hand. The belt must continue to move.

16.6.2 If the extruder has only been running for a short time, the belt tension must be checked more frequently at the beginning and adjusted if necessary.

16.6.3 Increase motor current. **Switch off the electronics before making any changes!** To do this, turn the potentiometer on the motor driver (TMC2208) a very small amount counterclockwise. Attention: the electronics must be switched off for this. Only turn it in small increments and test whether it produces the desired result. If the motor current is too high, the motor and/or the stepper motor driver can become very hot. This can cause the plastic parts to become soft or the stepper motor driver to switch off. The motor current must then be lowered again (turn the potentiometer clockwise).



## 16.7 The filament guide does not switch over

16.7.1 Check whether the trapezoidal threaded spindle is loose. If necessary, glue it into the fastening part or reprint the parts and mount them firmly.

16.7.2 Check and lightly sand all edges on components FG-I and FG-J. Also check the surfaces for unevenness and rework if necessary.

16.7.3 Check the spring tension of the detent mechanism, if this is too high or too low, there may be switching problems.

16.7.3 Check whether the aluminum profile is mounted straight and at an angle. Problems can also occur if it is mounted at an angle.

## 16.9 The finished filament unwinds from the spool again

If the filament produced is processed directly with a 3D printer, it can happen that the filament unwinds from the spool by itself. This can be prevented by either leaving the spool for one or two days (then the material takes on its shape) or by producing the filament with less cooling. If it is wound while still slightly warm, it will take shape more quickly.

## 16.10. Display problems

### 16.10.1 Display is difficult to read or reacts slowly:

Contrast must be adjusted. This can be done using a rotary potentiometer on the back of the display.

### 16.10.2 Display freezes and can no longer be operated:

Loose contact on cable of traction motor and/or spool drive. Check terminal connections.

# 17-Maintenance

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## 17.1 Cleaning / replacing the melt filter

Clean the melt filter in the nozzle at regular intervals or replace it if necessary. See chapter 13.

## 17.2 Lubricate moving parts

Lubricate the axial bearing and the trapezoidal threaded spindle on the filament guide with silicone grease at regular intervals.

## 17.3 Tighten screws

Check all screw connections at regular intervals and retighten if necessary.

## 17.4 Cleaning the device

Dust off all components with a dry cloth at regular intervals. Clean the fan and fan grille and remove dust with tweezers if necessary.

## 17.5 Replacing wearing parts

Depending on the type of plastic used, the nozzle and PTFE hose may wear out. These parts must then be replaced, as otherwise the filament quality will deteriorate or the function will be impaired. The PTFE hose has an outer diameter of 6 mm, an inner diameter of 4 mm and a length of 750 mm. The nozzle is a standard V6 3D printer nozzle with a 1.5 or 1.7 mm bore.

# 18-Disposal of the appliance

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You can return defective devices or electronic parts to us. You can find the current address in the legal notice at [www.artme-3d.de](http://www.artme-3d.de). Never throw defective appliances in the bin. Electronic waste can also be disposed of free of charge at suitable collection points in your region. Furthermore, all components of the extruder are suitable for other various tasks and can be used in other projects or devices.

# 19-Declaration of Conformity

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## EU - Konformitätserklärung



Der Hersteller

Artme GmbH  
Ludwigstraße 202  
67165 Waldsee  
kontakt@artme-3d.de

erklärt, dass das Produkt

Produktname: Original Desktop Filament Extruder MK3S und MK3S+  
Zweck: Herstellung von 3D Druck Filament und kleine Spritzguss-Anwendungen  
Seriennummer: 001001-999999

alle Anforderungen aus folgenden einschlägigen europäischen  
Verordnungen/Richtlinien erfüllt und mit ihnen rechtskonform ist:

**Richtlinie 2006-42-EG-Maschinenrichtlinie / Maschinenverordnung**  
**Richtlinie 2014-30-EU-Elektromagnetische Verträglichkeit**  
**Richtlinie 2011-65-EU-Beschränkung bestimmter gefährlicher Stoffe**

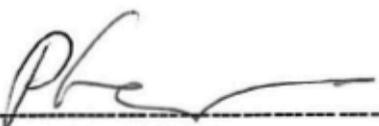
Folgende harmonisierte technischen Normen wurden angewandt:

EN ISO 12100:2010-Risikobeurteilung und Risikominderung  
EN ISO 14118:2018-Vermeidung von unerwartetem Anlauf  
EN ISO 13854:2019-Quetschen von Körperteilen  
EN ISO 13732-1:2008-Kontakt mit Heißen Oberflächen  
EN 60204-1:2018 Anhang H

Für die Zusammenstellung der technischen Unterlagen ist beauftragt:

Artme GmbH, Hr. Pfeifer, Ludwigstraße 202, 67165 Waldsee

Waldsee, 03.02.2025

  
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David Pfeifer, Geschäftsführer

ART**ME** 3D<sup>®</sup>