Complete Kit
Thank you and congratulation for choosing the Felfil Evo Complete Kit.

Felfil Evo is a plastic filament extruder, able to produce filaments for 3D printers starting from industrial pellets or plastics wastes.

The Felfil Evo Complete Kit includes all the components of the Felfil Evo project; In order to obtain optimal extrusion results, please follow the details of the complete project.

This guide is designed to allow you a good experience with Felfil Evo Complete Kit, please read this manual in all its parts before connecting and operating.

Felfil Evo is suitable for domestic, research or business use; it is wary of improper use.

<table>
<thead>
<tr>
<th>electrical</th>
<th>input 12V</th>
</tr>
</thead>
<tbody>
<tr>
<td>power usage</td>
<td>180W</td>
</tr>
<tr>
<td>weight</td>
<td>3.8Kg</td>
</tr>
<tr>
<td>temperature</td>
<td>max 250°C</td>
</tr>
<tr>
<td>gearmotor</td>
<td>up to 9 rpm</td>
</tr>
</tbody>
</table>
**Warnings**

Felfil S.r.l. does not assume responsibility and expressly disclaim liability for loss, injuries, damage, or expense arising out of or in any way connected with the assembly, handling, storage, wrong use or disposal of the product. Please, read this document before use Felfil Evo.

Any kind of modification will be at your own risk, and will result in the decay of the warranty. Felfil S.r.l. does not take any responsibility for damage occurred to people or object, caused by such modifications or improper uses.

- Do not use vinyl and PVC, they will produce toxic emissions.
- Do not eat or inhale neither the plastic pellets nor the extruded plastic.
- Do not use the extruder if any parts are missing or damaged. If you notice any damage to the unit, unplug the device immediately and contact the Felfil team for guidance.

Use the device only with specified input power. Using the device with any other input power is likely to damage the electrical and/or electronic parts of the device. Remind to keep the equipment out of children’s reach.

Use this device only to extrude plastic filament for 3D printing. No other use has been tested.

**Caution**

- Do not insert screws, nuts or materials unsuitable for extrusion in the catchment area.
- Do not insert your fingers in the feeding windows of the plasticizing screw located on the upper side of the pipe.
- Do not insert water in the extruder.
- Do not touch pipe, nozzle and resistor when the extruder is switched on, it may hurt you.
- Do not hit the extruder and its accessories or you could damage the extruder.
- Please, never try to extrude a plastic unless you are absolutely certain you know what type it is.
- Some polymers can undergo thermal decomposition resulting in potentially toxic fumes. So always use the Felfil Evo in a well ventilated area, or in presence of a suction hood (not your bedroom or inside your house), and understand the thermal decomposition properties of the polymer you are extruding.
- Be sure to check in on it periodically.

The Felfil Evo Complete Kit is a first-generation, experimental piece of hardware. Treat it as such. Basically, use common sense.

If you have questions, write us at support@felfil.com
The Felfil Evo Complete Kit includes those components:

- 1X Gearmotor (E1)
- 1X Structural Support (P1)
- 1X Nozzle (T1)
- 1X Extruding Screw (T8)
- 1X Melting Chamber (T5)
- 1X Teflon (T7)
- 1X Lower Case (C1)
- 1X Upper Case (C2)
- 1X Front Panel (C6)
- 1X Rear Panel (C7)
- 1X Encoder (E5)
- 1X Monitor (E4)
What's in the box

1X Felfilino
1X Main Switch
4X Feet

1X Low Hopper
1X High Hopper
1X Termocouple

1X Fan
1X Knob
1X Insulant

1X Power Supply
3X Cartridge Heater
1X O-ring
What’s in the box

1X Gearmotor Cap P2
Those are the tools you will need in order to assemble your Felfil Evo. Tools are not included in the package.

**Tools Needed**

- **hex wrench**

- **combination wrench**

- **gloves**

  [Please, wear latex gloves while assembling, when you see this symbol]
Insert the screw T8 and the engine cap P2 into the gearmotor hub E1 and close with two grub screws, make sure the screws rest on the flat of the shaft.

The gearmotor cap P2 must be placed with the bigger hole on the right.

⚠️ The screw must go all the way against the gearmotor cap.
Screw the melting chamber T3 and the teflon insulator T7 to the structural support P1.

The T3 component must be placed like in the zoom below.
Insert the extrusion screw T8 trought the structural support P1 and screw it to the gear-motor E1 [put the four washers in front between E1 and P1]

Note: insert only screws in the bottom holes.
Insert the thermocouple E9 in its hole in Chamber T3; then block it with a M3 grub screw.

Please, be careful when you close the grub screw. You could damage the thermocouple.
Insert the O-ring **T2** in the guide and screw the nozzle **T1** to melting chamber **T3**.

Pay attention, be sure that the oring stay on its guide.
Cut the heater cartridges cables at about 30cm.

Insert the three heater cartridge T4 into the melting chamber T3 and close them with grub screws.

⚠️ Please, use gloves. The material could be crippling.

⚠️ Pay attention. Ensure to fix the grub screws, or the heater could exit from the holes.
Remove the plastic cover from the plexiglass.

Fix the fan **E2** to the left lateral side **C4**

⚠ Pay attention. The fun must blow air inside.

Place the fan with the arrow pointing in this direction
Insert 4X electric wires in the display E4

Fix the PCB E3 with the display E4

Attention: if you cannot see anything on the LCD monitor, or it has a very low contrast, please regulate contrast by turning the screw on the back. [see the next page to identify the screw]
Use this screw to regulate contrast (if necessary)
- Remove the plastic cover from the plexiglass.
- Fix the encoder E5 on the right lateral side C3, using it’s nut.
- Push the knob E6 on the encoder E5.
- Insert 4X electric wires in the encoder E5.
Screw up the previous block to the lateral side C3
Connections #2
If present, remove the protective film from the case C2.

Insert the switch E7 in the squared holes of C2 (lower case)

Insert the four feet C5 into the holes of C2

Insert the power supply connector E8 into its hole of C2, then screw it using it’s nut and spring washer
Fix the previous block at the lower case C2, using the screws (X3).

The nozzle must be centered with its case hole.
Insert the Low Hopper S2 in P1 from its side.

Fix the screw (X2) to the gearmotor. [Whit this operation you will block the P1, S2 and E1 parts]

Do not close too much the screw. Stop when you reach the structural support.
Insert the insulant T9 around the melting chamber T3.

Insert the Upper Hopper S1 on S2 guides.

⚠️ Please, use gloves. The material could be crippling.
Pay attention. Do not invert the power cables order, or you will burn the electronic PCB.
Insert the lateral side C3 in the specific guide of the lover case C1
Pay attention. Do not invert the gearmotor cables order, or the screw will turn anticlockwise.

Pay attention. Do not invert the thermocouple cables order, or the temperature will be always displayed on 0°C.
Insert the lateral side C4 in the specific guide of the lower case C1.
Connections #5
Close the extruder with the upper case C1 and fix it to the lower case C2
Connect the power supply.
In order to obtain the best quality filament, Felfil Evo is designed to be placed on a common and stable table and to extrude on the floor.

The height of extrusion is called drop, and typically is about 80cm.

Moreover, with some materials, it will be useful to reduce or to increase the drop in order to obtain more constant diameter of the filament; typically PLA need this treatment.

So, if your filament is quite inconstant or get stretched too much, try to reduce or increase this value.
Plug the AC power cord into an electrical outlet.

Set the power switch to the [ I ] position

The Felfil Evo will display welcome text on the LCD panel. This is the beginning of the script that will guide you through the extrusion.
In the first step you can set the temperature turning the knob. Then press the knob to confirm.

Felfil Evo is heating, wait until it reaches the set temperature.

Now you can set the screw rpm. Press the knob to confirm.
This is the user interface when Felfil Evo is running. The LCD contains all information about the extruding.

**Current Temperature:** indicates the current temperature in the chamber.

**Set Temperature:** indicates the temperature the PID is heading for.

**Arrow:** switch between 2 functions:
- set temperature
- set engine rpm

**Engine speed:** indicates the set engine rpm: you can set this value from 0 to 9.

**6 rpm is a quite safe and efficient value.**

**RPM**

**Electrical Absorption**
Indicates the electrical current absorbed by gearmotor in Amperes.

Felfil Evo automatically cut off the power when the absorption is over 1.8A.

Keep pressed the knob in order to reset all settings.
When the screen below appears, it’s because Felfil Evo goes on protection mode. This usually occurs when the engine torque is too high, in order to avoid failure for engine and mechanics.

Usually this is due to a too low temperature in the melting chamber, or a too high speed of extrusion. However when the block occurs, please set the temperature to 200°C, and wait about 20 minutes, to be sure that the material in the chamber is properly melted.

Press the knob, and you will be able to restart the process from “set temperature”.
Usage

For a correct usage of Felfil Evo Complete Kit please follow these suggestions:

- Place it on a flat and stable surface before operating (a table is quite good);
- Do not place anything near Felfil Evo, it requires unrestricted airflow, for cooling, proper operation and to protect the electronic components from overheating;
- Do not operate the machine for more than 4 hours. After that cycle, please cool it down for 2 hours;

- The extruding screw must turn clockwise.

The first meters of filament will be dirty, and may have some metal shavings in it. Do not use this filament in your 3D printer. Extrude all the pellets that were in the hopper, if filament still looks dirty after this step, extrude more pellets to further clean the system.

Please pay attention:
- If the nozzle is not correctly tightened, plastic may exit, producing smell.
- If you recognise smell of burning plastic, immediately stop extrusion, open Felfil Evo and check that everything is ok.
- If the cartridge heater seems to be ruined, please substitute with a brand new one, in order to avoid any potential short-circuit.

If you have any problems using Felfil Evo filament extruder, contact support@felfil.com.

Maintenance

Felfil Evo needs some occasional maintenance: when you have finished to extrude, empty the hopper leaving the filament extruder running for few minutes.
Use always gloves while working on still hot components.
Remove the three nozzle screws only when these are cold.
In this section you can find some information about the plastic.

When using commercial pellets, rely on the maker’s identification of the type of plastic. When using recycled plastic, check the markings on the item(s) to determine which type of plastic you are using.

Do not mix types of plastic, as this may affect processing times, both in the extruder and in the printer.

The following is a table of general processing temperatures. Notice that the processing temperature may not be the same as the melt temperature. Temperatures will vary based on: humidity, ambient temperature and chemical composition of the polymers.

<table>
<thead>
<tr>
<th>Plastic</th>
<th>MFR</th>
<th>Density [g/cm3]</th>
<th>T [°C]</th>
<th>Speed [rpm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLA</td>
<td>6</td>
<td>1,3</td>
<td>180 (+/-10)</td>
<td>5</td>
</tr>
<tr>
<td>ABS</td>
<td>19</td>
<td>1,04</td>
<td>200 (+/-10)</td>
<td>6</td>
</tr>
<tr>
<td>HIPS</td>
<td>4</td>
<td>1,04</td>
<td>180 (+/-10)</td>
<td>6</td>
</tr>
<tr>
<td>TPU</td>
<td>-</td>
<td>1,22</td>
<td>190 (+/-10)</td>
<td>8</td>
</tr>
<tr>
<td>T45 (pc+abs)</td>
<td>4</td>
<td>-</td>
<td>180 (+/-10)</td>
<td>6</td>
</tr>
</tbody>
</table>

NOTE: The temperature ranges in the chart are approximate. It will require some trial and error to determine the right processing temperatures. Keep notes of actual temperature settings with different types of plastics, along with other operational notes, to develop a procedure that works well in your situation.
Presenting Felfilino

ICSP ENCODER

GND
VCC
GND
CST
VCC
TX
RX
DTR
VCC
SDA
SCL
SW
DT
CLK

LCD SERIAL PROGRAMMER

HEATER
MOTOR
FAN
OPEN-SOURCE
FILAMENT EXTRUDER
BRAIN

TC-K

GND
VCC
GND
VCC
TX
RX
DTR
SCL
SDA
GND
VCC
GND
DT
SW

GND

100mm
50mm

+12V
GND
+12V
GND
+12V
GND
+12V
GND
+12V
GND
+12V
GND
+12V
GND
+12V
GND

100mm

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Technical Data

- Gearmotor Specs
- 24V - 650 rpm
- Temp. Heat Rise - 90°C
- Output Shaft Rotation when viewed
- Grpm
- No Load Speed at 12V DC
- Duty Cycle - Continuous
- No Thermal Protection
- Thermal Protection - 200°C
- 2.3Nm
- Output Torque at 12V DC
- 2.19Amps
- Stall Current at 12V DC
- 0.300 Amps
- Nominal Current at 12V DC
- 0.300 Amps
- 3.20 Watts
- Input Power at 12V DC
- 2 Ohms
- Motor Resistance at 24V
- 12V DC
- Motor Type - 55 Series
- Complete Kit Manual
Marking:


On its case is reported the serial number of the product #EBxxxx along with CE and RAEE marks.

Contacts:

Felfil s.r.l.
VAT number: 11482100010
Corso Castelfidardo 30/A, 10129 Torino, Italy
support@felfil.com

Please be sure to download always the latest version of this manual from: felfil.com
Manual revision: 1.0
Last revision date: 24 October 2017