

BCN3D

+

Paste extruder

user manual

INDEX

1. PRIOR INFORMATION	3
Specifications	3
FFF Technology	4
Compliance	5
Safety	6
2. STARTUP PROCESS	8
Unboxing	8
BCN3D+ Paste Extruder diagram	9
3. FIRST STEPS	12
Paste Extruder assembling	12
Firmware load	12
Z axis calibration	13
Loading the syringe	13
4. MATERIALS AND EXAMPLES OF OPERATION	17
Mashed potato	17
Chocolate	17
Aggregates	17
5. TROUBLESHOOTING	17
6. MAINTENANCE	18
7. TIPS AND TRICKS	19
8. TECHNICAL SUPPORT RepRapBCN	19
9. WARRANTY, REFUNDS AND REPLACEMENT POLICY	20
10. TERMS OF SERVICE	20

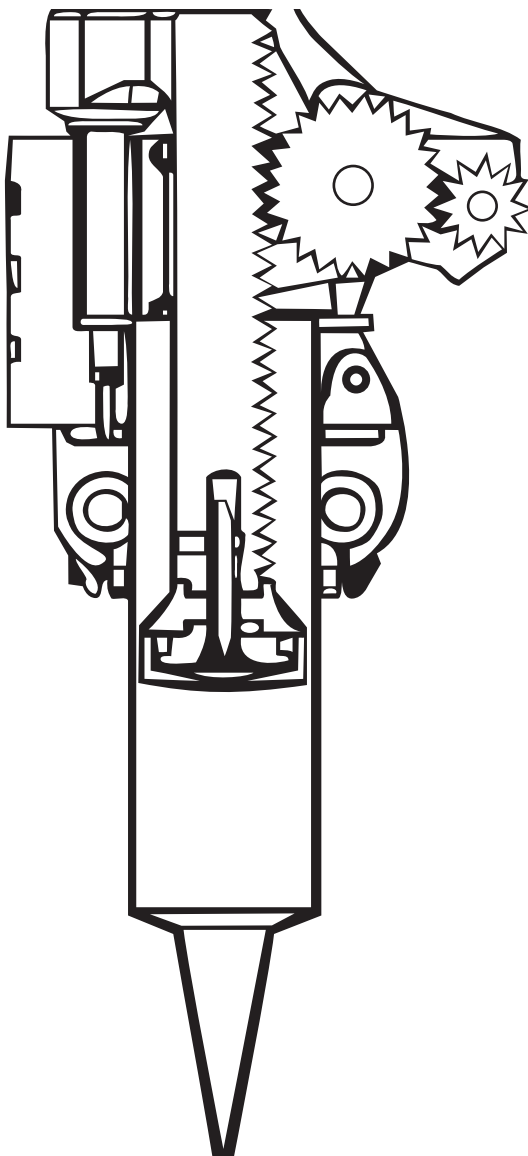
1. PRIOR INFORMATION

Specifications

Print Technology: Physical Dimensions: Weight:	Paste Deposition Layer (PDL) 480mm x 480mm x 455mm 12 kg (without paste in the syringe)
Printing Volume:	Length: 220mm Width: 200mm Height: 90mm
Number of extruders:	1
Layer height:	0,5-1,7mm (with 1mm nozzle) 1-3,5mm (with 2mm nozzle)
Positioning resolution:	X axis: 0,05mm Y axis: 0,05mm Z axis: 0,1mm
Working temperature: Max. Hot bed temperature: Max. extruder temperature: Syringe volume:	15-35°C 80°C (measured on the perimeter) 100ml
Compatible materials:	Chocolate Mash Potatoe Cement Any material with paste texture
Electronics:	Arduino Mega 2560 + RAMPS 1.4
Connectivity:	SD Card (autonomous operation) USB Cable (controlled through Repetier Host)
Firmware: Compatible files: Code converter software: AC Input: Power requirements:	BCN3D+ specific (based on Marlin) STL Slic3r, Cura AC 100-240 V, ~4 amps, 50-60 Hz 200W

DLP Technology

The Paste Extruder is an extruder based on the PDL (Paste Deposition Layer) technology. This technology allows the manufacturing of parts by deposition of material through a syringe. The material is extruded using a plunger connected to a stepper motor through a reduction gear based on the instructions given in a digital model previously divided in layers with the help of a digital software. The head makes the necessary movements to deposit a layer of material, then performs a slight vertical movement and starts the next layer. The process is repeated until the object is completed.



The printer is ready to accept any add-on published by RepRapBCN through an easy and guide lined process. One of its main features is interchangeable extruder heads, either for using multiple heads at the same time or extruders designed for several other textures and materials.

Compliance

Fundació Privada Centre Cim hereby states that Paste Extruder complies with the essential requirements and other relevant provisions of the following Directives:



Low Tension Directive 2006/95/CE
Directive on machinery 2006/42/CE
Directive RoHS2011/65/UE

Safety

To avoid possible residual risks for the user , please read carefully the following safety measures.

REPRAPBCN IS EXEMPTED OF ANY LIABILITY IF THE USER DOES NOT FOLLOW THE FOLLOWING HANDLING INSTRUCTIONS:

- Very important. Like with any other appliance, do not touch the terminals of the cables connected to the main. The voltage is 230V and there is a risk of electrocution. Other cables from the machine working at 12V and present no risk.
- This machine produces and emits radio frequencies during use. It is important to install and use the equipment according to the instructions in this manual to avoid harmful interference to domestic appliances such as television or radio. If the machine causes interference, increase the separation between it and other appliances.
- Print materials are not innocuous and may emit toxic fumes. Always print in open or vented spaces.
- Do not breathe closer to 25cm from the extruder head or heads when printing.
- Do not place any object or body part between the moving parts of the machine when functioning.
- Do not touch its hot parts (hotbed and hotend) when the machine is turned on, or within 15 minutes of operation.
- Do not connect or disconnect any device and/or electrical connector when the machine is on.
- Oversee proper function of the machine during operation.
- In case of an emergency, stop the machine using the STOP button and unplug.

Safety warnings

The following signs have been arranged on the printer to warn users about areas of potential risk arising from its use or possible actions that are not recommended.



Hot surface danger



Moving parts, danger of crushing.



Hot Surface, allow it to cool down before handling.



Moving parts, danger of crushing, disconnect before handling

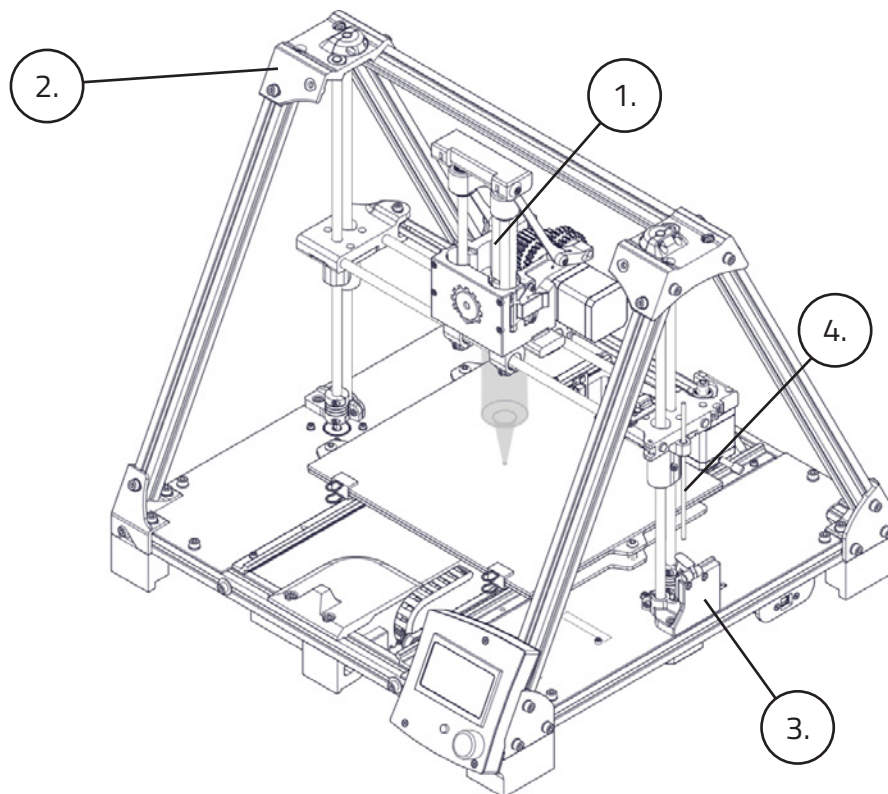
2. UNBOXING

Box content

The BCN3D+ is delivered inside a properly secured cardboard box, measuring 260 mm long, 165 mm wide and 105 mm high.

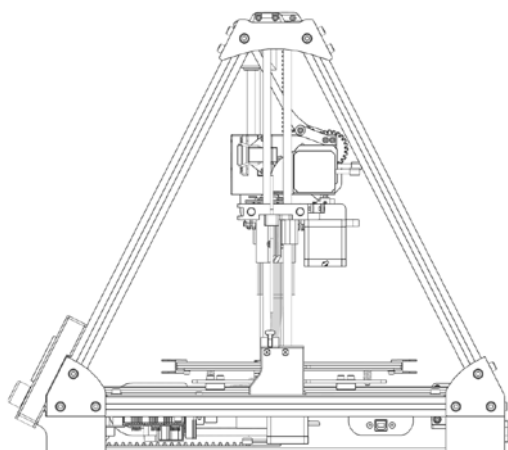
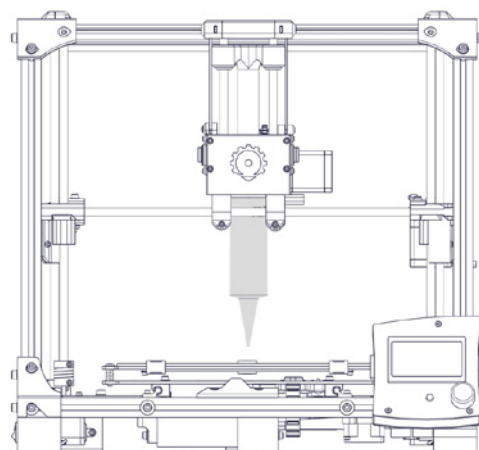
- Printed parts
- Metal sheets
- Rods and guides
- NEMA 17 motor
- Fasteners
- Bearings
- 100 ml. feeding syringe

BCN3D+ Paste extruder diagram

Perspective

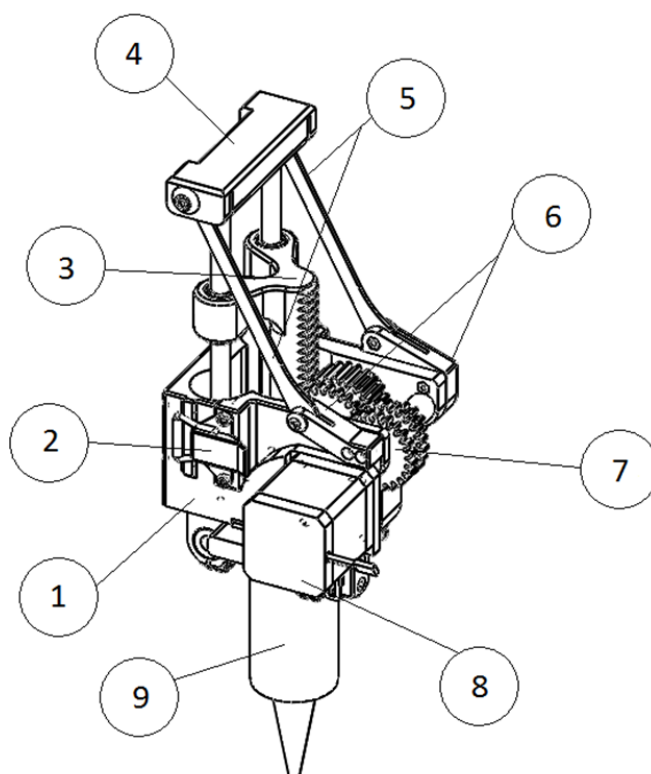
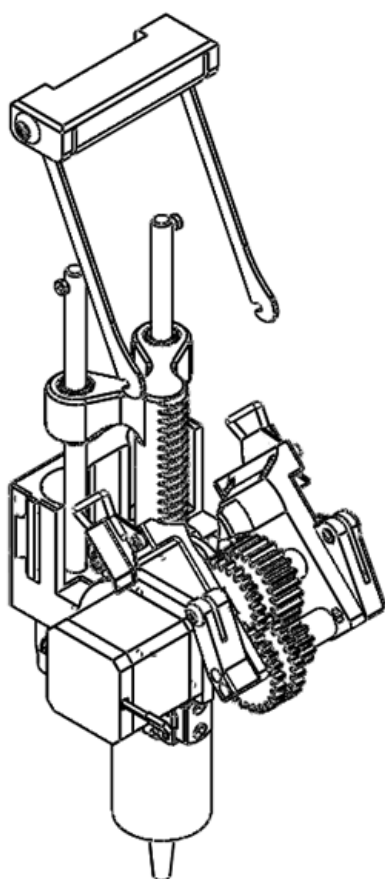
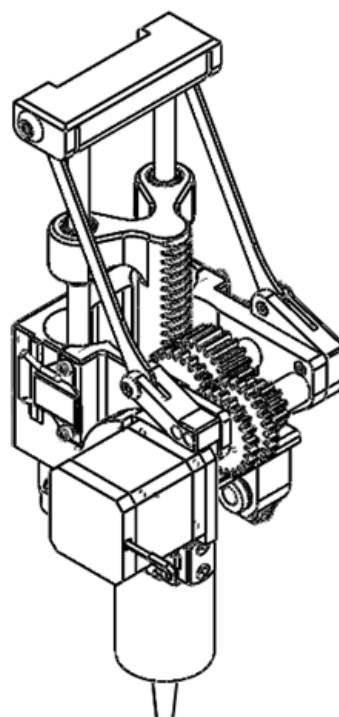
- 1. Paste Extruder
- 2. Paste Extruder's (*) modified vertex
- 3. Z axis endstop adapter
- 4. 140 mm. rod

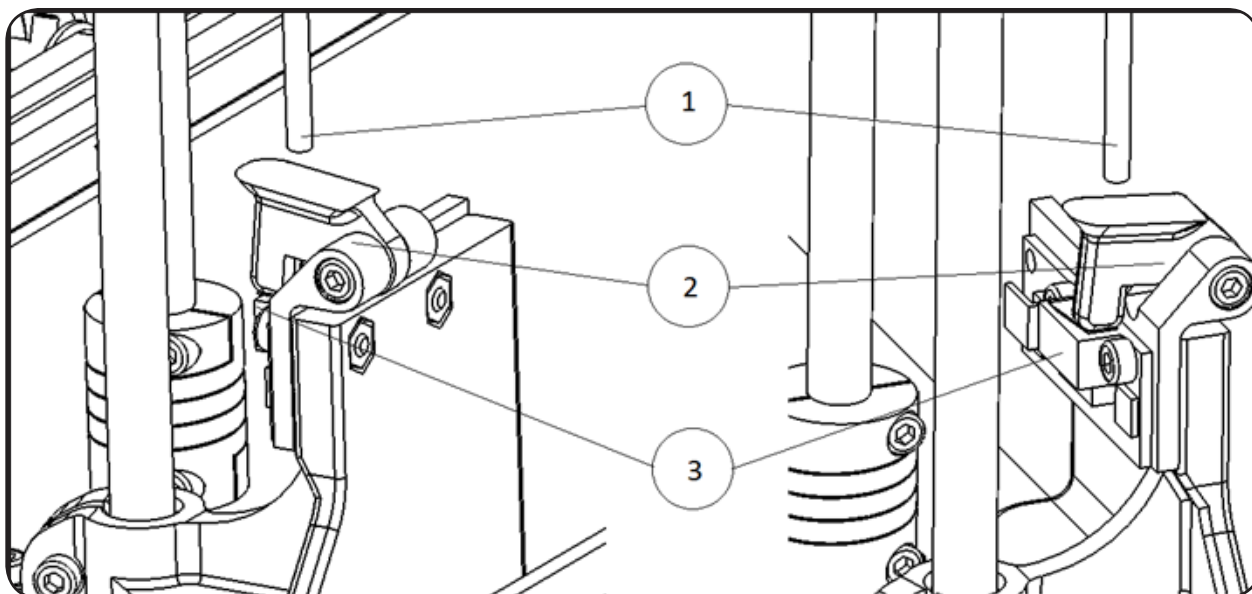
*Downloadable from www.reprapbcn.com in STL format

Left view*Front view*

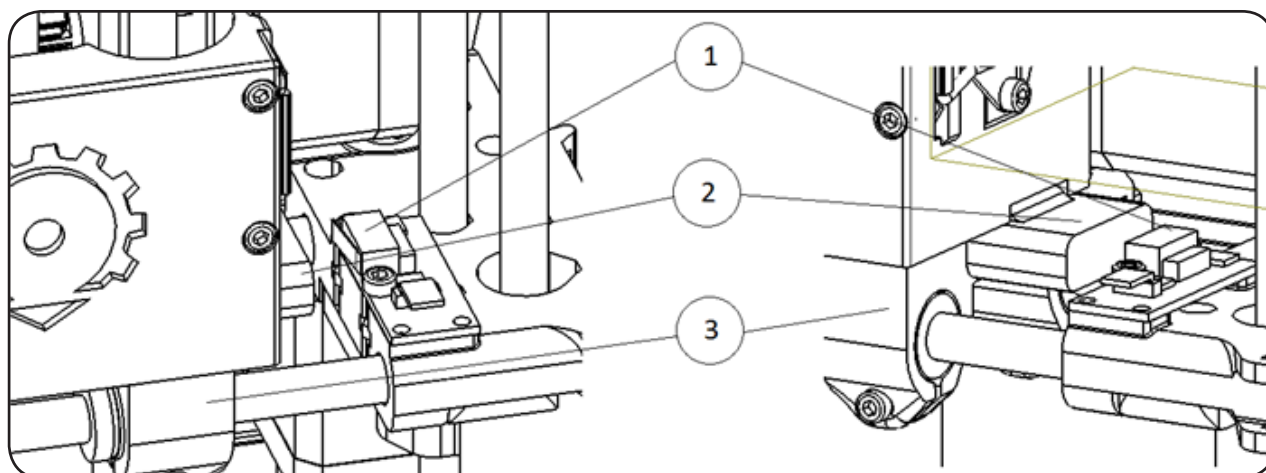
Extruder

1. Extruder body
2. Latch
3. Toothed plunger
4. Bar holder
5. Braces
6. Braces support
7. Gear train
8. Stepper motor
9. 100 ml syringe

*Open**Closed*

Z axis endstop

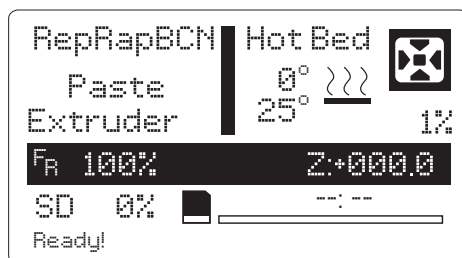
1. 140 mm threaded rod
2. Z axis endstop adapter
3. Endstop

X axis endstop

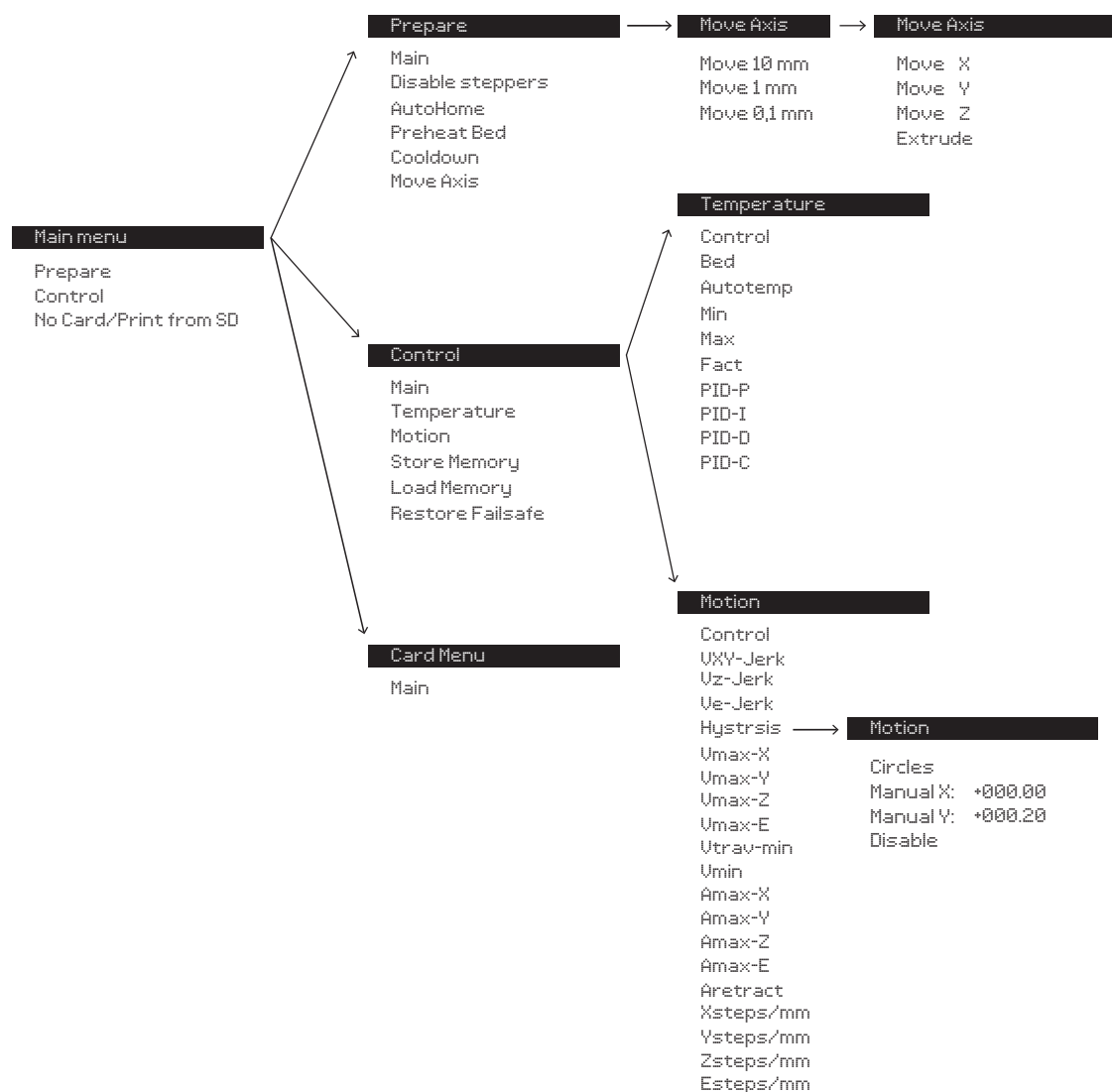
1. Endstop
2. X axis endstop adapter
3. Carriage

3. FIRST STEPS

1. Assembling the Paste Extruder (Downloadable from the support download section at www.reprapbcn.com)
 2. Loading the firmware (Explained in the assembling manual).
- If successful, the following screen should appear when the printer is turned on.



The full menu diagram is shown below:



3. Z axis calibration

The Paste Extruder requires a new height calibration due to the difference in dimensions at the Z axis relative to the standard extruder.

It is necessary to calibrate every time the syringe or nozzle type is changed.

- The bed must be levelled, meaning it must be perpendicular to the Z axis. After installing the Paste Extruder, it should be rechecked.
- The syringe and the Paste Extruder in its closed position will be mounted as described in the assembly manual. Selecting PREPARE> AUTOHOME on the screen first, manually adjust the Z axis endstop rod height and repeat until achieving a 0,2 mm height between the nozzle and the printing surface (easily measurable with a folded paper).

4. Loading the syringe

Proceed to load the syringe with the selected paste (mashed potato is recommended for first-time printing as it is easy to work with). The amount of air trapped inside should be minimized. For this purpose, different methods may be used in accordance with the material (vibration, centrifuging, inertial forces ...).

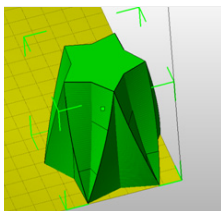
5. Starting a new print

Once the Paste Extruder is calibrated in height and in its closed position, with the syringe loaded with no air inside and the Gcode file loaded in the SD Card, printing can begin.

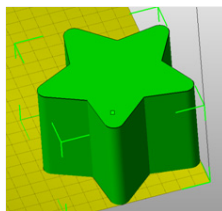
Required files

The necessary files to start printing a Gcode such as the configuration files (ini) and the 3d models (stl) can be found in the Paste Extruder downloads section at "www.reprapbcn.com".

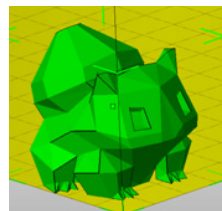
- Choosing a "SpiralVase" shape is advised for a first print due to its simplicity. Use the included "STAR_SPIRAL_PASTE.gcode" (fig.1)
- Once accomplished, print "STAR_PASTE.gcode" (fig.2)
- As a final test, print "BULBASAUR_PASTE.gcode" (fig.3)



(fig.1)



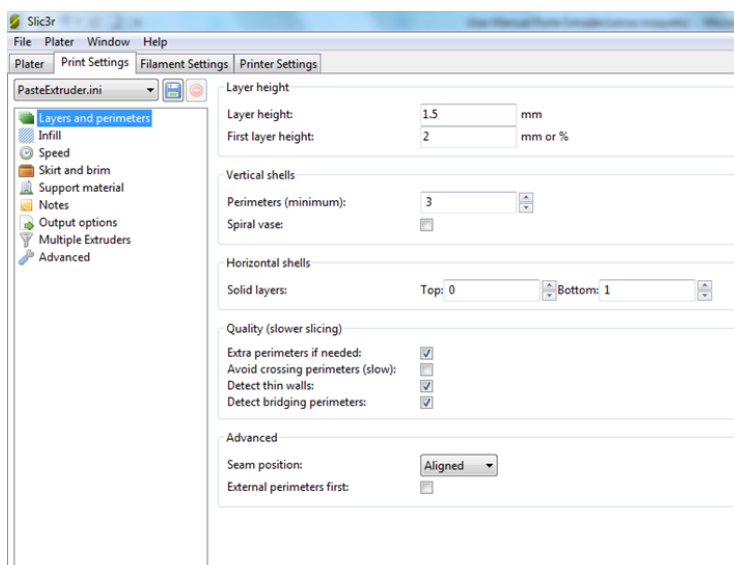
(fig.2)



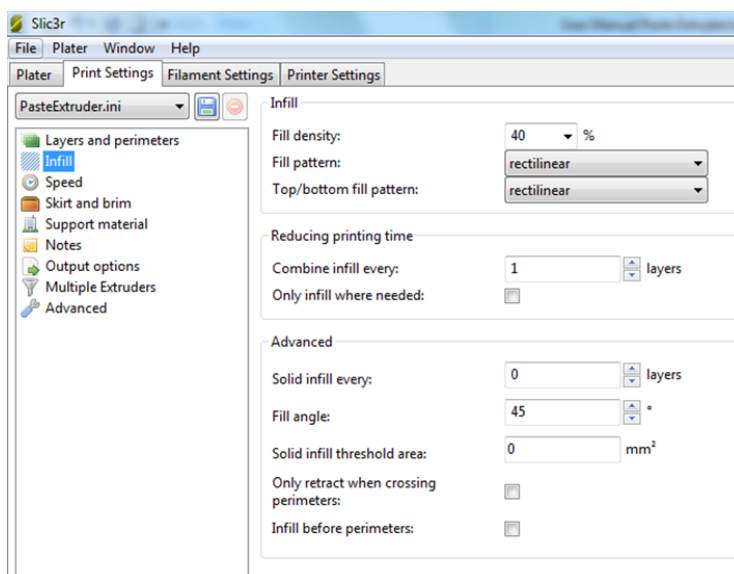
(fig.3)

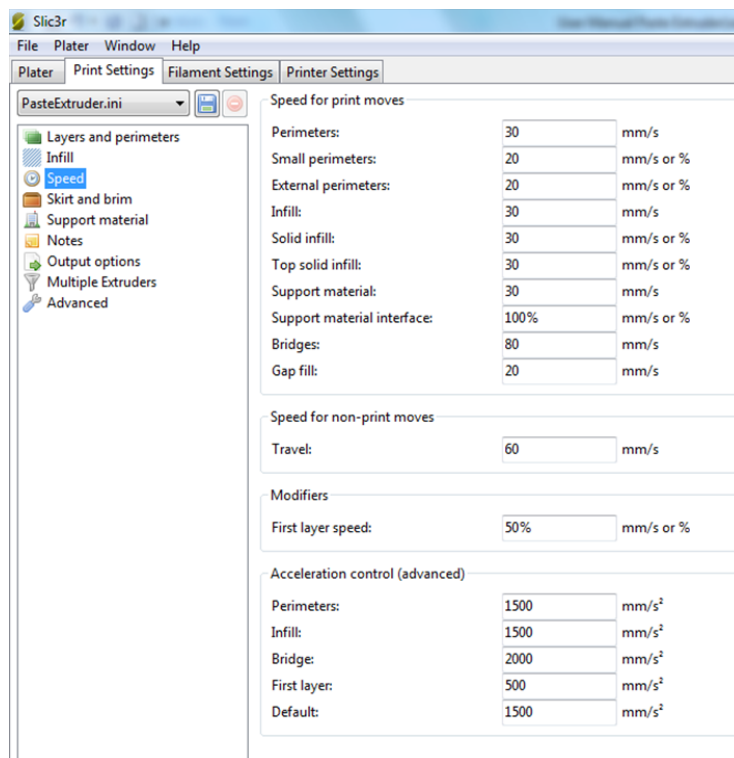
Configurations

In future and more complex prints, parameters such as printing speed, material flow, retract, infill (fill density) and nozzle size. It is necessary to clarify that relevant SLIC3R configuration parameters affecting Gcode file generation have been modified. Understanding them will help comprehending how the Paste Extruder works and how to setup new configurations.

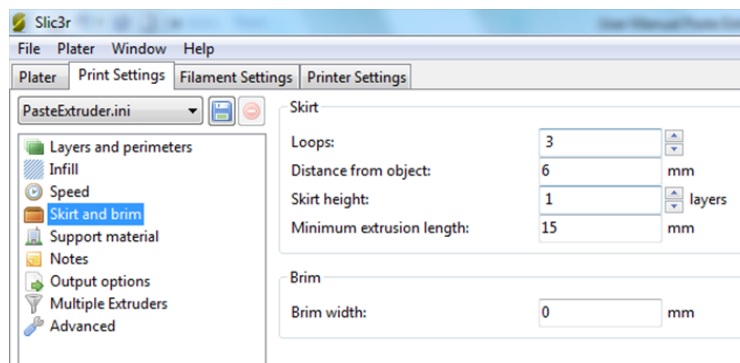


Layer height=1,5mm (always smaller than the nozzle width)

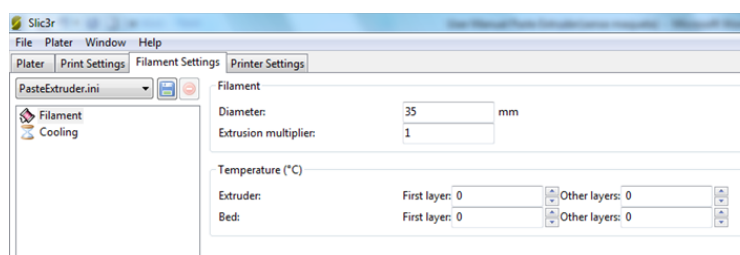




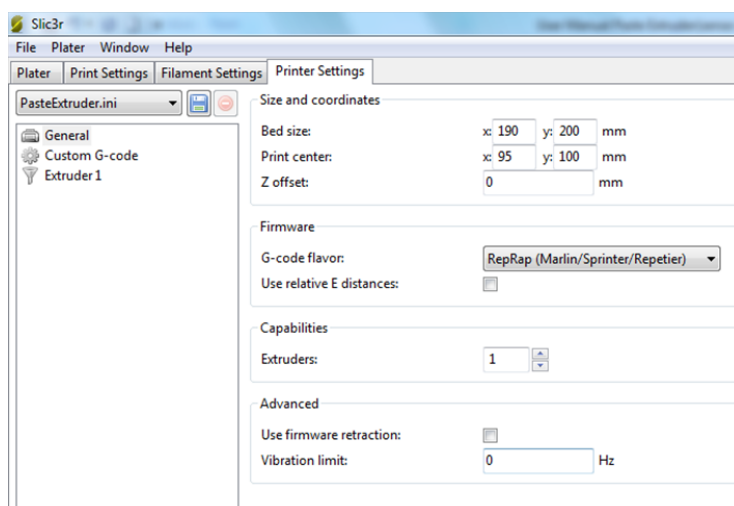
Slow speeds shown in the picture above are necessary when printing with the Paste Extruder (limitations imposed by the material and not the extruder).



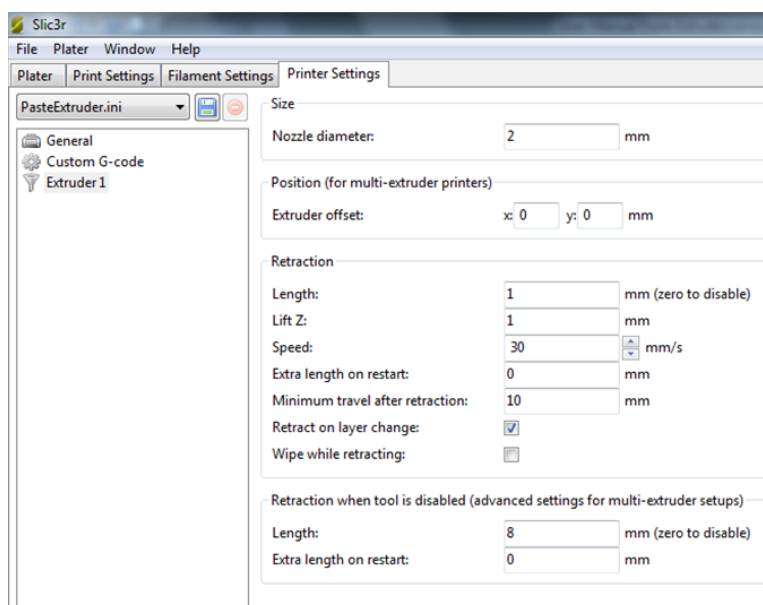
Use 3 skirt loops to ensure a proper flow before starting a new print.



A default 35 mm filament diameter is used to simulate the included syringe. This value corresponds to the internal diameter of the syringe. If the syringe is changed, so should this parameter. The temperature of the bed is left at 0 ° C because in this case, no heat is applied. The extruder is unplugged so its temperature is irrelevant.



Despite being firmware limited, it is advisable to change the printing surface dimensions.



The Paste Extruder standard nozzle diameter is 2 mm.

4. MATERIALS AND EXAMPLES OF OPERATION

MASHED POTATO

Food printing is one of the easiest ones. It does not require temperature control and allows the manufacture of slightly taller objects. The only parameter to monitor is viscosity, which is determined beforehand by the proportion of water (or the liquid being diluted).

To print a text with an overall 5 mm height, a light and watery solution will work; on the contrary, printing a 60 mm tower would require higher viscosity. There is a viscosity limit from which extrusion is not possible, the material becoming too thick.

CHOCOLATE

Chocolate: One of the most difficult materials to print with due to the temperatures required for it to flow, but above all due to the complicated occurring crystallization processes. A prior tempering process consisting of a cycle of temperatures depending on the chocolate composition in question is required.

Always work in a temperature-controlled environment to ensure the solidification of chocolate (about 21° C).

AGGREGATES

Concrete and plaster, among others. Once again, the liquid/solid ratio has to be monitored to vary viscosity and help the paste flow.

Take into account time constraints due to this materials properties, also, a rise in temperature might be noticed. (Caution: Do not exceed BD PLASTIPAK 100 ml working temperature)

5. TROUBLESHOOTING

The paste does not properly adhere to the glass

Choosing a surface suitable for printing is advised. Whereas chocolate works perfectly with a porcelain dish, mashed potatoes needs a sheet of wood (or other rough material) for good adhesion.

The motor does not rotate accordingly

1. Adjust the pololus power.
2. Comprobar que los engranajes pueden girar libremente moviendo el motor con la mano (se accede a PREPARE > DISABLE STEPPERS), con el émbolo dentado desengranado, es decir, con el Paste Extruder abierto.
3. Check that the electrical wires are not damaged and are connected correctly.

The extruder cannot be closed using the latch closures

1. El embolo dentado no está engranando correctamente. Girar ligeramente el engranaje transmisor hasta que encaje.
2. La jeringa no está bien colocada en el cuerpo del Paste Extruder. Colocar la jeringa correctamente.
3. A foreign body blocks the Paste Extruder lock. Remove the foreign body.

The syringe plunger does not work although the motor is rotating

1. The printing speed will usually be very slow, it could not be noticeable but the paste could be properly flowing .
2. Make sure the toothed plunger and all the gear are working correctly.

It works but it does not extrude material

1. The printing surface could be too close to the nozzle. Level the bed and/or adjust the Z axis endstop rod.
2. Extruded printing material viscosity is too high. Reduce its viscosity and try again.

6. MAINTENANCE

Due to the extruder characteristics, it is very important to make checks of every component not to loose printing quality and avoid mistakes.

LUBRICATING THE SYRINGE

Using a lubricant (e.g. olive oil) between the rubber plunger and the plastic tube is of the utmost importance. It is advisable to deposit the lubricant in the space between the two adjustment membranes.



GEAR TRAIN MAINTENANCE

Gear wear can cause too much play between the teeth. It is advisable to periodically examine the gears and replace those that are excessively worn-out or broken.

SYRINGE REPLACEMENT

Depending on the materials to extrude, the syringe lifetime can vary. If extreme friction is detected, it is advisable to replace it with a new one.

7. TIPS AND TRICKS

There are certain things that we must take into account when using and maintaining the machine:

- Do not spill liquids on the hotbed or hotend as they could damage the other components. To clean individual machine parts, first remove them from the machine. The only advised product for improved printing adhesion is the coating spray included with the machine.
- If difficulties are encountered while removing the printed objects, remove the glass first to avoid decalibration.
- Do not overheat the hotend. Although its maximum temperature is firmware limited, do not use other methods to heat it above the established range.
- Do not handle the electronic parts of the machine when it is on, it could cause damage to its components.
- Do not turn off the printer immediately after printing. Allow some time for the fans to cool the different components down.

8. TECHNICAL SUPPORT RepRapBCN

Forum

Before taking any other action, you should have a look at our forum. It is very likely another user has encountered the same problem, and the forum is where most of them are solved.

<http://www.reprapbcn.com/es/forum>

Asistencia SAT

Call our customer service line:

+34 93 473 88 24 (TECH SUPPORT)
+34 93 348 70 25

E-mail

If the problem persists, you can contact us directly by email. An expert from RepRapBCN will answer you back with a solution as soon as possible.

info@reprapbcn.com

This information is also available in our website contact section:

<http://www.reprapbcn.com/es/contact>

In any case, it is very important to attach the printer serial number so we can keep track of it and know in advance any problems that may arise. A photograph could also help identify more easily what has happened.

9. WARRANTY, REFUNDS AND REPLACEMENT POLICY

Todos los componentes de la BCN3D+ tienen un año de garantía. Solo se aceptan devoluciones en productos no afectados, dentro de un plazo de 14 días después de su recepción. Una vez finalizado ese plazo, todas las ventas se considerarán definitivas. Por productos “no afectados” se entiende que el dispositivo no ha sido nunca montado, encendido, programado o de otra forma alterado.

RepRapBCN no puede aceptar devoluciones en artículos adquiridos a los cuales se les ha aplicado corriente eléctrica, o han sido de alguna manera programados, modificados o afectados. Sin embargo, ofrecemos piezas de repuesto o servicio técnico sobre los artículos sobre los que se haya probado que contienen defecto de fábrica, y siempre trabajaremos con usted para volver a poner su equipo en funcionamiento.

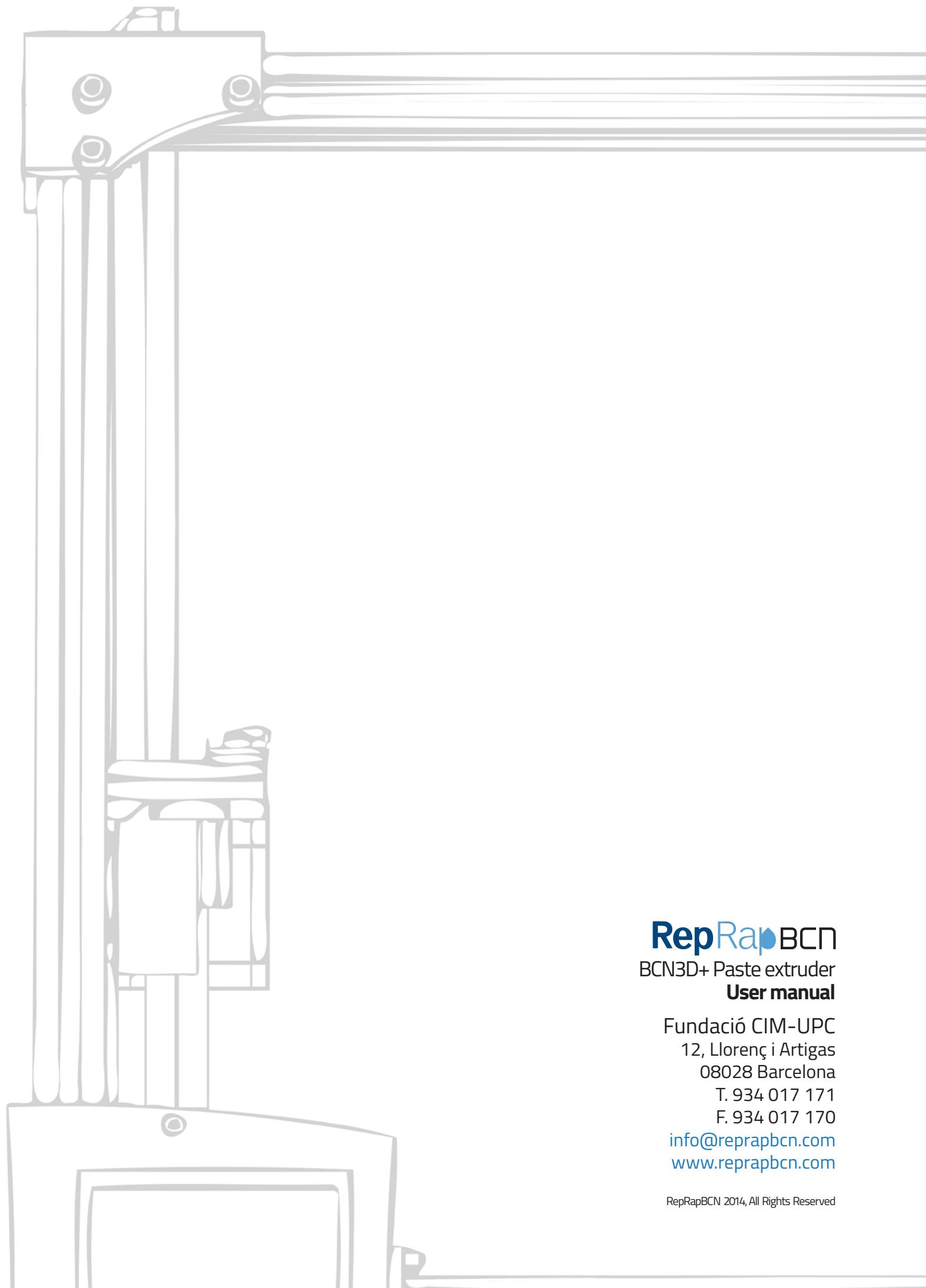
10. TÉRMINOS Y CONDICIONES DE SERVICIO

All the information contained in this manual is subject to change at any time without notice and it is offer just for convenience. purposes only.

RepRapBCN reserves the right to modify or revise this manual at any time. You accept being subject to any modification and/or revision. . Please contact RepRapBCN support tem if you want to obtained the most updated information.

The design of this manual and all text, graphics, information, content, and other material displayed are protected by copyright, trademark and other laws

Certain trademarks, trade names, service marks and logos used or displayed on this Website are registered and unregistered trademarks, trade names and service marks of RepRapBCN and its affiliates. Nothing contained on this manual grants or should be construed as granting, by implication, estoppel, or otherwise, any license or right to use any trademarks, trade names, service marks or logos displayed on this manual without the written permission of RepRapBCN or such other owner. Any unauthorized use of the information, materials or trademarks included in this manual might incur in violation of copyright laws, trademark laws, privacy and publicity laws and other laws and regulations.



RepRapBCN

BCN3D+ Paste extruder
User manual

Fundació CIM-UPC

12, Llorenç i Artigas

08028 Barcelona

T. 934 017 171

F. 934 017 170

info@reprapbcn.com

www.reprapbcn.com

RepRapBCN 2014, All Rights Reserved