Description.

L3D extruder is a device for 3D-printing any kind of chocolate and chocolate glaze.
It is installed in place of a regular printer extruder.
Preparation of chocolate compositions is similar to preparing models for printing with filament.
The device is food safe and Dishwasher safe with any type of detergent.
It is recommended to remove and wash the device at least once per 100 working hours, in order to avoid accumulation and formation of solid particles that are contained in Chocolate.

Principles of operation.

The extruder consists of 4 parts:
1. A container for raw materials with a lid.
2. The feeding part of the chocolate mass, which includes:
- Stepping motor;
- gear pump;
3. Heating element with temperature sensor.
4. Nozzle.

The solid chocolate goes into a container in which the melting process takes place. A pump sucks molten chocolate, and the required quantity, is fed through the nozzle onto the print area.

Assembling
Printer
1. Remove the plastic extruder with heater and temperature sensor from the printer.
2. Change the extruder carrier (if necessary).
3. **Connect the heating element and the temperature sensor from the kit to printer board into bed port.
4. **In the extruder temperature sensor port on the printer board, set the "dummy sensor" from the kit.
5. The extruder is ready for installation.

** The "dummy sensor" and the connection of the chocolate extruder to the port of temperature control of the bed is necessary only on those printers whose lower temperature control range of the extruder is above 25 degrees Celsius. If the firmware of your printer allows you to set the temperature of the extruder from 25 degrees, then connect the heater and the sensor in the regular places of heating of the extruder.
You also need to enter a line at the beginning of the G-code: M302 S0; Allow extrusion at any temperature
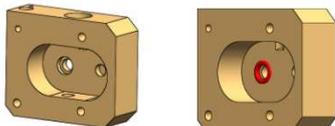** If you connecting a to the bed port, make sure that the bed is heated from 12-24 volts, and not from 220 volts. This information applies to printers such as Tevo tornado and others ...
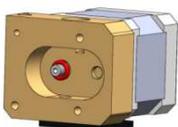
Extruder.

1. Attach the fastening plate to the front of the stepping motor (shaft side).
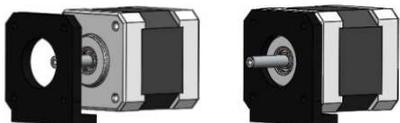
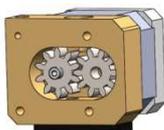2. Install the sealing silicone ring into the groove on the pump housing.

3. Put the pump housing together with the O-ring on the motor shaft.

4. Install a shaft of a conducted gear wheel.
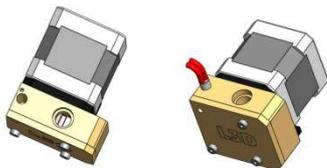5. Install both gears.

6. Install transparent seal from kit between cover and housing. Close the gear pump cover, use plastic washers on screws and tighten the screws softly.
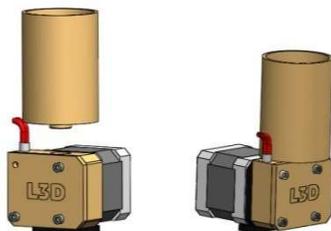
7. Install nozzle.
8. Install extruder on mount plate.
9. Install into holes heater and temperature sensor.

10. Install tank for chocolate.
    Attention! - screw and unscrew the tank if there is chocolate in it, it is possible only with a warmed extruder to avoid damage to the thread.

11. Extruder is ready for print.

Loading and melting the chocolate.

   After assembly and installation of the extruder on the printer, set the temperature of the extruder in the range of 35-40 degrees Celsius, depending on the type of chocolate chosen. Install automatic mixing device from the kit before loading the chocolate.

   In the raw material tank, load chocolate or chocolate glaze, close the lid of the tank and wait until the chocolate melts completely. You can periodically mix the contents of the tank for faster melting.

   For mixing, it is recommended to use a special spatula from the kit. Do not use metal objects. Only use plastic or wooden spatulas to avoid damage to the protective coating of the extruder.

After completely melting the chocolate, feed some filament to pump the system. After the chocolate begins to flow through the installed nozzle, you can start printing.

Covering the table for printing.

Printing can be done on any flat and clean surface.

   When printing huge models, it is recommended to print on a standard printer - glass. Glass provides good adhesion with prolonged printing. After the printing is finished, it is possible to separate the finished product with a thin object (knife or scapula). It is also possible to heat the glass to melt the lowest layer and without effort to remove the finished product.

   When printing small and fragile products, you can put food film on the glass, which will allow to separate the products together with the film from the glass, and after the film from the chocolate. If the film adheres to the glass so strongly that it is not possible to separate the products without damaging them, the surface of the glass can be evenly scratched (for example by sandpaper), thereby reducing the area of contact between the film and the glossy part of the glass.

The smaller the area of the glossy part of the glass, the less force is required to separate the food film.

Configuring the software.

Below is a table of averages for setting up the printer. A more accurate adjustment is made depending on the type of chocolate used and the printer model.

The fluidity of chocolate differs from the plasticity of fluidity; therefore, in the settings of the slicer, you need to specify the corrected value instead of the actual diameter of the nozzle

Filament dia.	1.85	2.45	3.55
Nozzle size	0.6мм	0.8мм	1.0мм
Corrected value **(input it into slicer)**	0,5	0,65	0,82
Temperature of chocolate	30 - 40^{0}C		
Printing speed	10 - 100мм/сек. Minimal layer time 120 seconds		
Recommended temperature in the room	From +15^{0}C to +24^{0}C		

Equipment.
1. Stepper motor - 1 pc.
2. Heating element - 1 piece.
3. Thermistor - 1 pc.
4. The casing of the gear pump is 1 pc.
5. Capacity for chocolate - 1 pc.
6. Cap for a container - 1 pc.
7. Mounting plate - 1 pc.
8. Gear Pumps -2 pcs.
9. The shaft of the driven gear of the pump is -1 pcs.
10. Nozzle - 3 pieces.
11. Fixing hardware - 1 set.
12. Silicone seals - 5pcs.
14. "Dummy" for the extruder heater - 1 pc.
15. Plastic spacers - 1 set.