



# **Operation Guide for Mixing Color printer**

**V1.3**

# Symbols

- Extrusion feeder:** A mechanism to transport filament to the hotend.
- Hotend:** The part to melt and eject filament.
- Nozzle:** The outlet at the front end of the hotend, usually made of copper, use the size of the front hole to describe its main size.
- Print head:** The hotend and its attached cooling system.
- Control panel:** The system that realizes human-machine interface in 3D printer.
- Mixer:** The parts and software to realize the color mixing function.
- Mixing Extruder:** An extruder that can mix different color filament together.
- Channel of Hotend:** The channel through filament enter into the mixing hotend.
- Tool Chain (Tool head):** In short, one tool chain corresponds to one printing color, in most slicing software, tool chain is also be called extruder.

For singel color or general multicolor printer, each extrusion feeder corresponds to one hotend/nozzle, so the number of tool chain is equal to the extrusion feeder and nozzles.

For mixing color printer, because the same hotend can print different colors, so we can set many tool chains.

- Virtual Extruder / Virsual Tool Chain:**

In mixing color extruder, multiple extrusion motors correspond to one nozzle. One combination of extrusion rates can correspond to one tool chain. In order to distinguish them from single color and simple multi color 3d printer, they are called **Virsual Tool Chain**.

- Gradient Mixing:**

A function of automatic color mixing transformation processing. When starting a print file from SD card (slicing it with single color), it will automatically adjust the mixing ratio of extruder according to the preset ratio (preset virtual extruder) when the printing height changes, so as to realize a Gradient color effect.

- Random Mixing:**

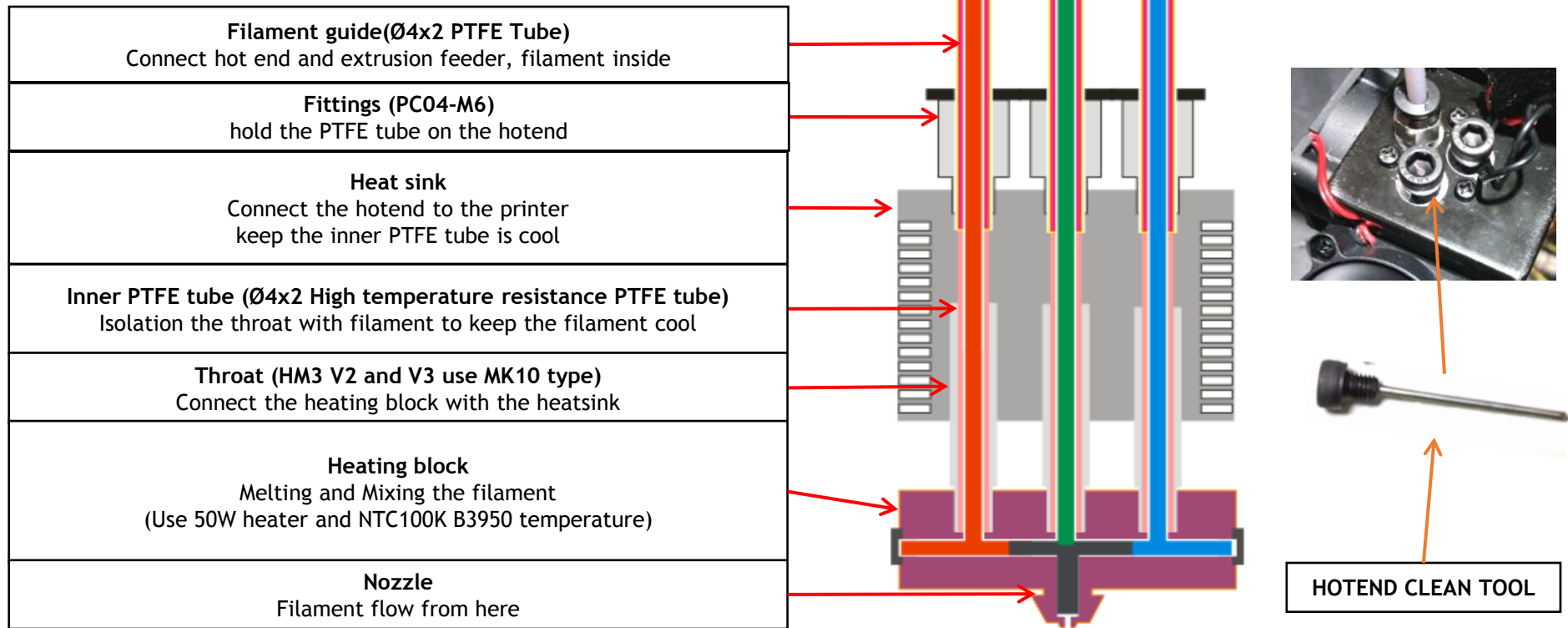
A function of random color mixing transformation processing. When you start a print file from SD card (slicing it with single color), it will randomly adjust the mixing ratio of extruder when the printing height changes, so as to realize a **Random color** effect.

- Hotend Clean tool:**

A screw with a small rod which can be used to clean the feeding channel at the hot end, or to close the temporary non feeding channel.

# Principle and structure of hotend

- Different more than one color filaments are fed into the HOTEND by extrusion feeder, they are melted in the heat block and mix together and then flow out from nozzle. **By adjusting the feeding ratio of extrusion feeder, we can get different color filament from the nozzle.**

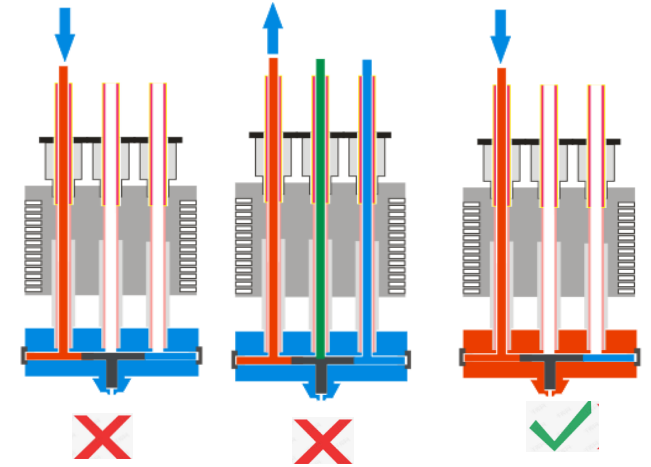


**NOTE: This figure is a schematic illustration of the principle, actual structure may different!!**

- Since the individual channels are ultimately connected, the filament may flow backwards into the empty channel, which can cause the empty channel be clogged. Therefore, we **must insert filament or use "HOTEND clean tool" to close the unused channel to prevent the melted filament to reflux.**
- Because there is a color mixing cavity inside hotend, **when switching extruder, it does not immediately switch to the desired color.**
- **Keep the heatsink to cool is very important, otherwise the filament can't be push to the nozzle well, it will cause the clogged issue, make sure the cooling FAN working when nozzle temperature is over 60 degree.**
- PC04-M6 fitting is easy to break, do not use a wrench to tighten it.

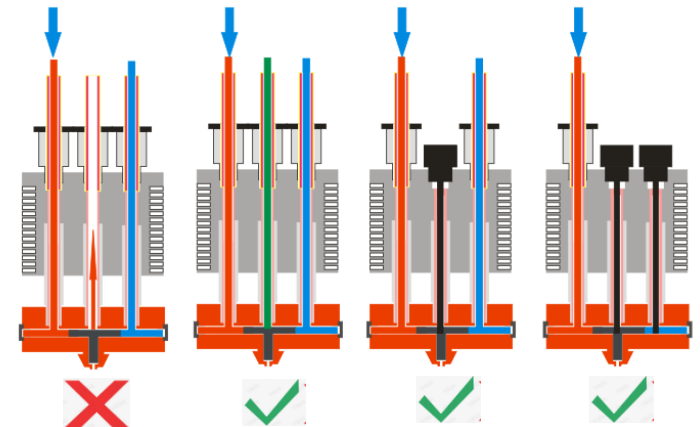
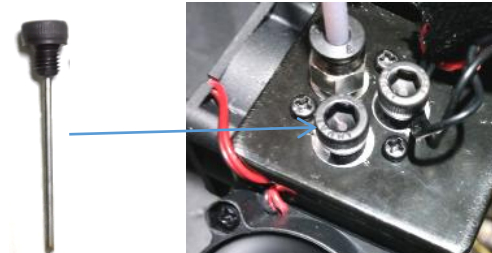
# !!ATTENTION!!

**DONOT** load / unload filament when the nozzle temperature is less than 150 °C



**DONOT** feed-in filament over 10mm if any of the channels is empty, otherwise may cause it be clogged.  
you can:

1. Load filament to all channels
2. Use a *hotend clean tool* to close empty channels.



# How to print singel color 3d object

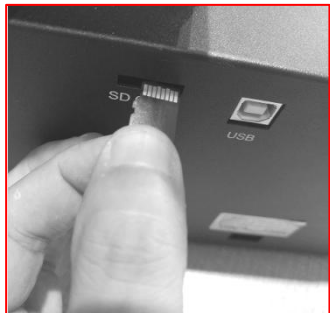
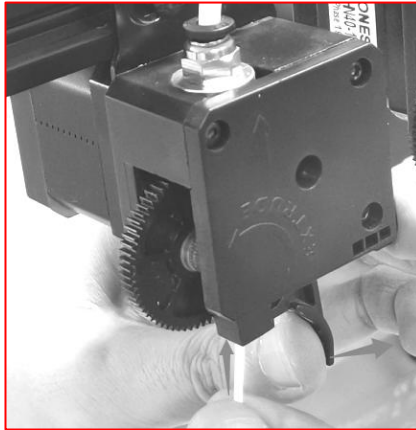
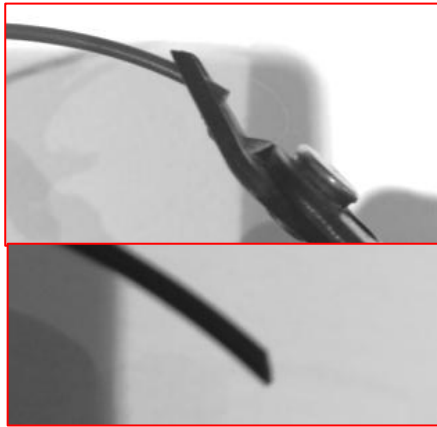
Step 1: Refer to the [silcing guide for mixing color printer](#) to covert the 3d mode file to gcode file.

Step 2: Preheat the nozzle to about 170 degree

Step 3: Use hotend clean tool to close the unused channle of hotend

Step 4: load filament to the hotend. **NOTE: For M4 printer, recommend to load the filament to the center channel.**

Step 5: print gcode file from SD card



# Change printed color by adjust mixing rate (LCD12864)

Step 1. Start to print a singel color gcode file([Vase.gcode](#)) from SD card.

Step 2. For LCD12864 screen, set on the menu>>

- Mixer>>Active V-tool: Select the vtool currently printed, or use the default value, the range is 0 ~ 15.

- Mixer>>Mix>>Component1~4(M4): Arbitrarily adjust the percentage of extruder 1 ~ 4, the range is 0 ~ 100.

- Mixer>>Mix>>Comit V-tool Mix: Redistribute the percentage of all extruders in proportion and send it to the current vtool.

After setting up, on the ideal menu shows **VT00L:0**

```
Main          ↑
Active V-tool: 0
Mix           +
Reset V-tools  +
GradientMix :disable→
```

```
50 7 4 39 0° 0°
VT00L:0  20° 20°
% 0 Y -18 Z 0
»100% 00:00
29V5 Ready.
```

```
Component 1: 100
Component 2: 15
Component 3: 8
Component 4: 74
Commit V-tool Mix
```

```
Component 1: 50
Component 2: 7
Component 3: 4
Component 4: 39
Commit V-tool Mix
```



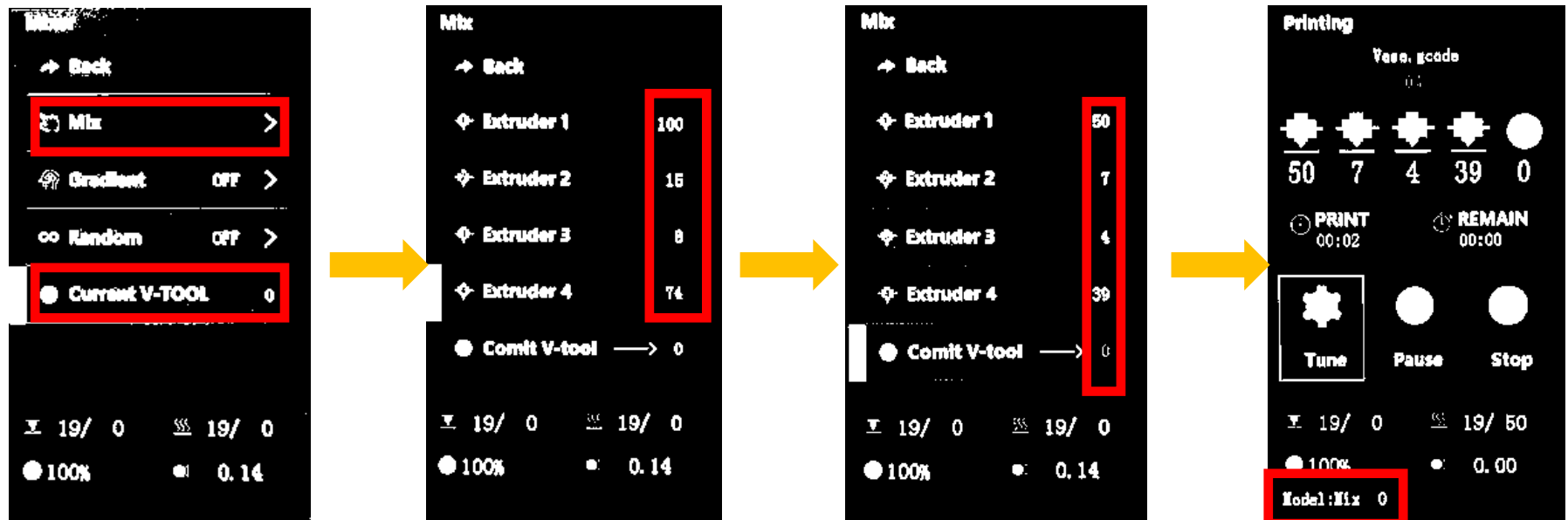
# Hot to Change printed color by adjust mixing rate (LCD-DWIN)

Step 1. Start to print a singel color gcode file([Vase.gcode](#)) from SD card.

Step 2. For TFT screen, set on the menu>>

- Mixer>>Current V-TOOL: Select the vtool currently printed, or use the default value, the range is 0 ~ 15.
- Mixer>>Mix>>Extruder 1~4(M4): Arbitrarily adjust the percentage of extruder 1 ~ 4, the range is 0 ~ 100.
- Mixer>>Mix>>Comit V-tool: Redistribute the percentage of all extruders in proportion and send it to the current vtool. The current vtool value changes color.

After setting up, enter printing, on the printing menu shows: *Mix 0*



# How to realize gradient printing(LCD12864)

Step 1. Start to print a singel color gcode file(*Vase.gcode*) from SD card.

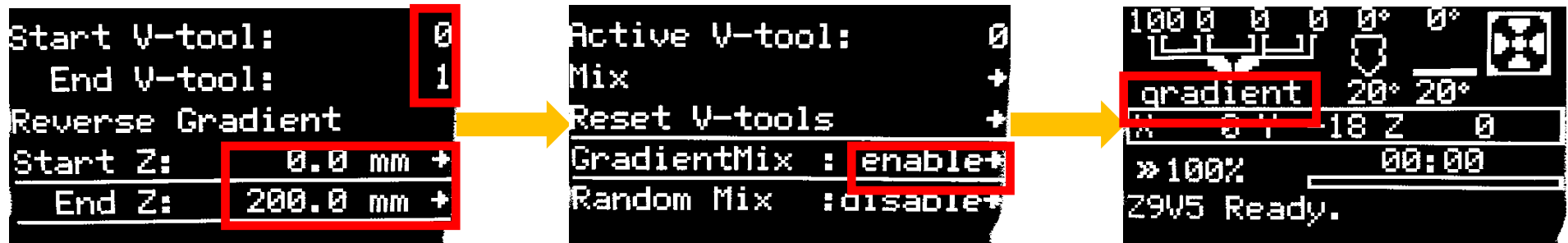
Step 2. For LCD12864 screen, set on the menu>>

Mixer>>Gradient: **disable** >>

Start Z: set the start Z heigth(such as:0mm)      End Z: set the END Z heigth(such as:200mm)

Start V-tool: set the start V-tool(such as:0)      End V-tool: set the end V-tool(such as:1)

After set Start Z isn't equal to the End Z, and Start V-tool isn't equal to End V-tool,  
the LCD will shows "Gradient : **enable**" and on the ideal menu shows *gradient*





# How to realize gradient printing(LCD-DWIN)

Step 1. Start to print a singel color gcode file([Vase.gcode](#)) from SD card.

Step 2. For LCD-DWIN screen, set on the menu>>

Mixer>>Gradient: **OFF** >>

Start Z: set the start Z heighth(such as:0mm)

End Z: set the END Z heighth(such as:200mm)

Start V-tool: set the start V-tool(such as:0)

End V-tool: set the end V-tool(such as:1)

After set Start Z isn't equal to the End Z, and Start V-tool isn't equal to End V-tool, the LCD will shows  
“Gradient : **ON**” and on the printing menu shows: *Gradient 0--->1*



# How to realize random printing(LCD12864)

Step 1. Start to print a singel color gcode file([Vase.gcode](#)) from SD card.

Step 2. For LCD12864 screen, set on the LCD menu>>

Mixer>>Random Mix: **disable** >>

Start Z: set the start Z heigth(such as:0mm) End Z: set the END Z heigth(such as:200mm)

Height: set interval distance(such as:10mm), When the z-axis distance changes beyond this value, the mixing ratio changes randomly once.

Extruders: set the number of extruders with random variation(such as:4)

After set Start Z isn't equal to the End Z, the LCD will shows "Gradient : **enable**" and on the ideal menu shows **random**



```
Mixer      ↑
Start Z:   0.0 mm +
End Z:     200.0 mm +
Height:    10.1
Extruders: 4
```

```
Active V-tool: 0
Mix            +
Reset V-tools  +
GradientMix :disable→
Random Mix    : enable→
```

```
100 0 0 0 0° 0°
┌───┴───┐
└───┬───┘ 20° 20°
┌───┴───┐
└───┬───┘ -18 Z 0
»100%      00:00
Z9V5 Ready.
```

# How to realize random printing(LCD-DWIN)

Step 1 Start to print a singel color gcode file([Vase.gcode](#)) from SD card.

Step 2. For LCD-DWIN screen, set on the menu>>

Mixer>>Random: **OFF** >>

Start Z: set the start Z heigth(such as:0mm)

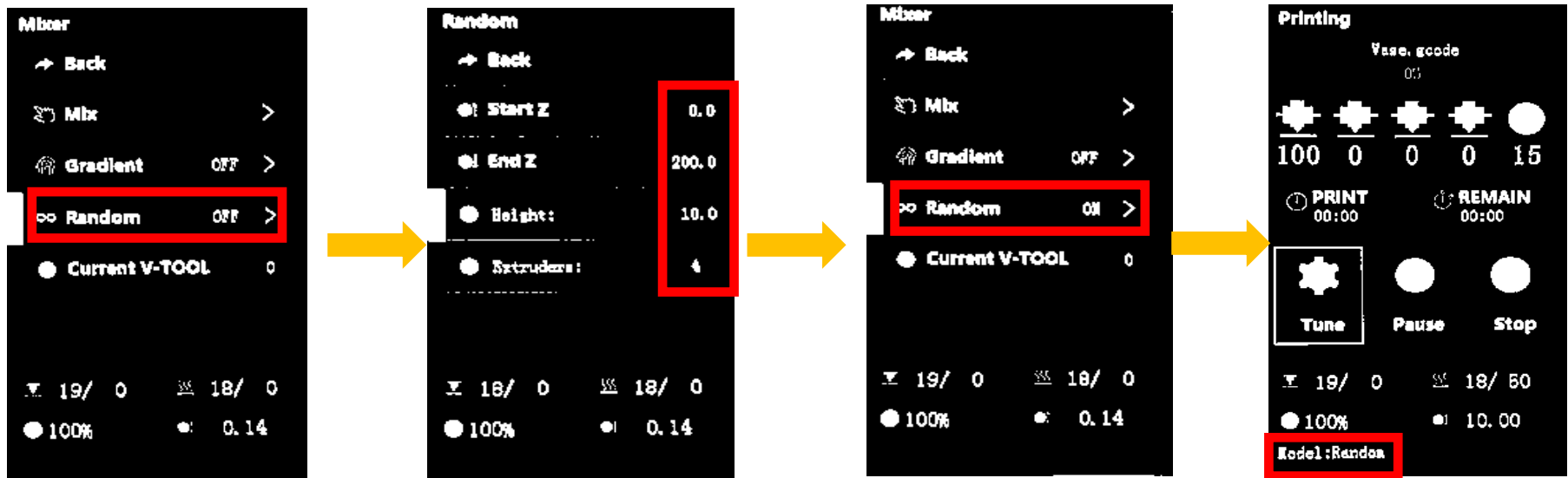
End Z: set the end Z heigth(such as:200mm)

Height: set interval distance(such as:10mm), When the z-axis distance changes beyond this value, the mixing ratio changes randomly once.

Extruders: set the number of extruders with random variation(such as:4)

After set Start Z isn't equal to the End Z, the LCD will shows "Random : **ON**" and on the printing menu shows:

*Random*



# How to realize gradient Random mixing by modifying Add gcode)

You can also add a **M166/M167** command into the **gcode** file to apply gradient / random mixing printing, so it can automatically work when print from SD card.

Gradient Mixing:

For example: **M166 S1 A0 Z200 I0 J1**

**S1** → Enable gradient mix **A0** → startZ is 0mm **Z200** → EndZ is 200mm **I0** → Start V-tool is 0 **J1** → End Vtool is 1

Random Mixing:

For example: **M167 S1 A0 Z100 H0.2 E3**

**S1** → Enable Random mix **A0** → startZ is 0mm **Z100** → EndZ is 100mm **H0.2** → change color every 0.2mm height

**E3** → 3 extruders (E0-E2) will be used to mix

Please note that there is no **Tn(T0 ~ T16)** command after **M166/M167** command in the **gcode** code, because it will stop automatic gradient/Random mixing function

```
/**
 * M166: Start a gradient mix
 *
 * S[bool] - Enable / disable gradients
 * A[float] - Starting Z for the gradient
 * Z[float] - Ending Z for the gradient.
 * I[index] - V-Tool to use as the starting mix.
 * J[index] - V-Tool to use as the ending mix.
 **/
```

```
/**
 * M167: Start a random mixing
 * S[bool] - Enable / disable random mixing
 * A[float] - Starting Z for the random mixing
 * Z[float] - Ending Z for the random mixing
 * H[float] - Minimum height of changing mixing rate
 * E[int] - how many extruders used on random mixing
 * */
```

# Hot to print multi-color 3d object

Step 1: Refer to the **silcing guide for mixing color printer** to covert the 3d mode file to gcode file.

Step 2: Preheat the nozzle to about 170 degree

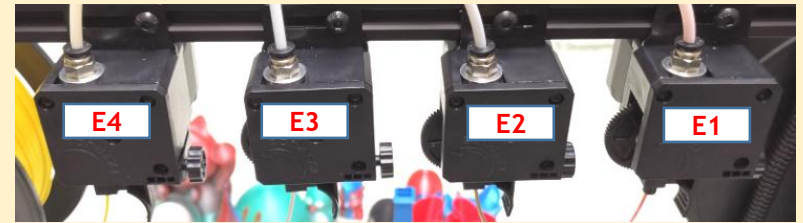
Step 3: Load filament to the hotend, and use hotend clean tool to close the unused channles

Step 4: print gcode file from SD card(**4C\_Niko\_Dog.gcode**)

## TIPS 1:

Make a mark on the extrusion feeder in order to quickly distinguish the extruder

PS: Their sequence depends on wiring



## TIPS 2: Recommended channels for different quantities of filaments

M3



use one Channle

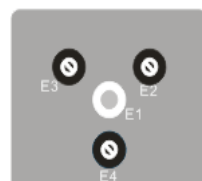


use 2 Channle

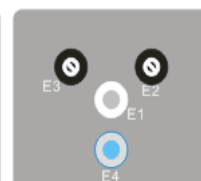


use 3 Channle

M4



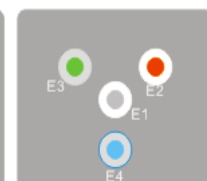
use one Channle



use 2 Channles



use 3 Channles

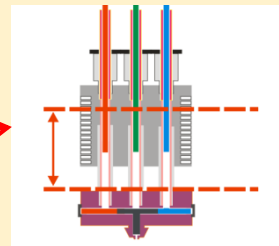


use 4 Channles

## TIPS 3:

The steps to load filaments:

1. Heat nozzle, and then use *hotend clean tool* to close unused channel (remove the fittings first)!
2. load all of the filaments into the hotend, stop when it enter the hotend about 30~40mm.
3. **MENU>>Motion>>Move axis>>Set V-TOOL to 3**(for M3) **or 4**(for M4).
4. **MENU>>Motion>>Move axis>Extruder>>** feed until the filament flow from the nozzle



# Hot to slicing multi-color 3d object

Multi Color 3D printing steps:

Step 1: Load 3D printing model into Cura software.(Fig1)

Step 2: After setting the print parameters, slice to generate the initial gcode code(4C\_Niko\_Dog\_orig.gcode) and preview the model.(Fig2)

Step 3: Open the initial code, **add the plug-in**, set the plug-in parameters, generate the final print gcode code(4C\_Niko\_Dog.gcode), and preview the model.(Fig3)

Step 4: print gcode file from SD card. Final physical model.(Fig4)



Fig1

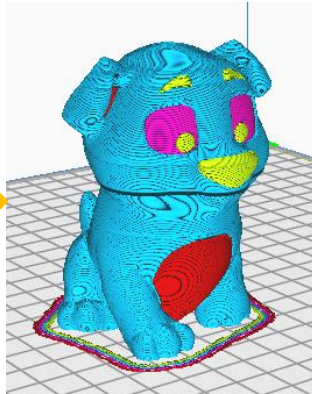


Fig2

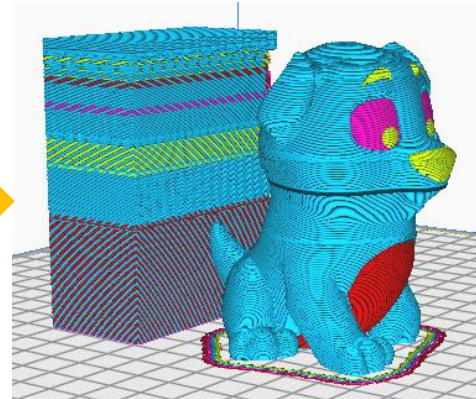


Fig3



Fig4

**More detail, please refer to:** <https://github.com/ZONESTAR3D/Slicing-Guide>