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Color Mixing Feature User Guide

⚠ This guide is made for 4 extruders with 4-IN-1-OUT mix color hot end.

The color mixing feature is a function to mix multi different color filaments and extruded from one nozzle to get a new color filament. By adjusting the extrude ratio of each extruder, it can get different color filament. For example, mix Magenta and Yellow filament as a ratio 5:1, we can get Red filament, and mix Magenta and Yellow filament as a ratio 1:1, we can get Orang filament.
ZONESTAR mix color 3d printer can achieve the following functions:

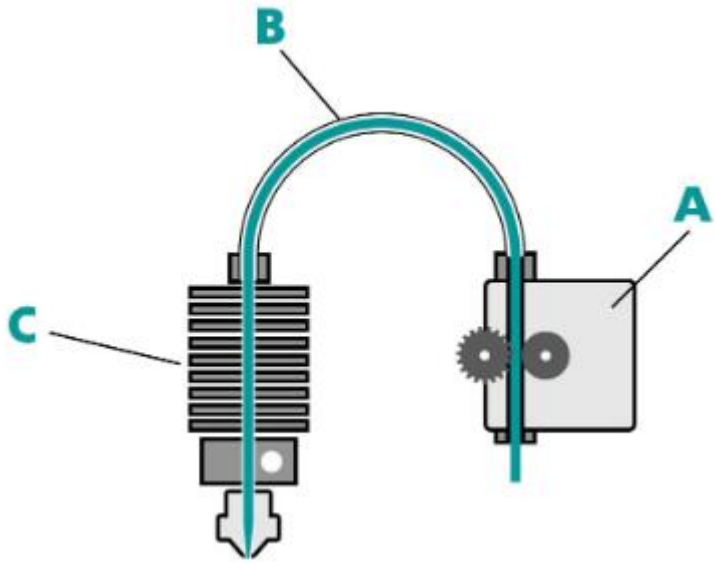
1. **Manual color mixing feature:** Manually adjust the extrusion ratio of each extruder (mixing ratio) by the LCD control panel to change the printing color.
2. **Gradient color mixing feature:** The gradient mix function is a feature of changing the mixing ratio according to printing height automatically. It can be activated from the LCD control panel or by adding gcode to "Start G-code" when slicing.
3. **Random color mixing feature:** The random mix function is a feature of changing the mixing ratio according to printing height randomly. It can be activated from the LCD control panel or by adding gcode to "Start G-code" when slicing.
4. **Mixed multi-color feature** To use **virtual extruder**, the printer can print more colors than the actual extruders. For example, printing 8 color 3d models by using a 4 extruders 3d printer. Now ZONESTAR mix color 3d printer can set up to 16 ***virtual extruders***.

Term explanation

The following documents may mention some proper noun that will be used in color mixing printing. Let's give a description of these names so that you can better understand the content of the following documents.

Bowden extruder

A Bowden extruder is a type of extruder that pushes filament through a long and flexible PTFE tube (Bowden tube) to the hot end. ZONESTAR multi color 3d printers are used Bowden extruder. wiki page

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A. Filament feeding mechanism   B. PTFE tube    C. Hot end
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Extruder / Tool Chain

Sometimes we call the entire extrusion system (A+B+C in the figure above) as an extruder, but sometimes extruder specifically refers to the Filament feeding mechanism (A in the figure above), which needs to be determined based on the context. In some slicing software, the extruder also be called "Tool Chain", "Tool head" or "Tool".

Mixing ratio

The volume ratio of each filament added during mixing is called "mixing ratio", for FDM mixing color 3D printers, the mixing ratio is achieved by controlling the rotation speed of the filament feeding mechanism. The ZONESTAR 3D printer supports setting the mixing ratio based on percentage or extruder ratio relationships. For example, "E1:E2:E3:E4 = 10:20:30:40" and "E1:E2:E3:E4 = 1:2:3:4" and "E1:E2:E3:E4 = 0.2: 0.4: 0.6: 0.8" are equivalent. But when the mix ratio showed on LCD screen, they are always displayed at a percentage.

Virtual extruder / Virtual Tool / VTool

Since in slicing software, one extruder corresponds to one filament, in order to use the mixed filament, we can make the slicing software think that this is a new extruder. And in order to distinguish it from the actual extruder, it is called "virtual extruder". The "virtual extruder" also be called "virtual Tool" or simply as "VTOOL". For ZONESTAR mix color 3d printer, 16 virtual extruders has been set and they have a default mixing ratio. You can change the mixing ratio of each virtual extruder any time, but after the machine restart, a printing (from SD card) is finished or abort, they will be reset to default value automatically.

⚠ **Note**

1. To distinguish between an actual extruder and a virtual extruder, the actual extruder will be written as "Extruder #n" or "En" (n is from 1 to 4), such as "Extruder #1" or "E1", and the virtual extruder will be written as "VTOOLm" (m is from 0 to 15), such as "VTOOL4".
2. The default mixing ratio of virtual extruder may different in the different versions firmware, please read the release note of the firmware.
3. When using mixed multi color printing, it is recommended to use the the virtual extruder instead of the actual extruder as much as possible. Default the mix ratio of "VTOOL 0" is "E1:E2:E3:E4 = 100: 0: 0: 0", so it is completely equivalent to actual extruder #1; The mix ratio of "VTOOL 1" is "0: 100: 0: 0", so it is completely equivalent to actual extruder #2; The mix ratio of "VTOOL 2" is "0: 0: 100: 0", so it is completely equivalent to actual extruder #3; The mix ratio of "VTOOL 3" is "0: 0: 0: 100", so it is completely equivalent to actual extruder #4.

How to set mixing ratio of virtual extruder (for 4-IN-1-OUT mix Color hot end)

We can set the mixing ratio of each virtual extruder by LCD control panel or by dding command in the gcode file.

Set mixing ratio by LCD control panel

Steps:

- **Control>>Mixer>>Mix>>VTOOL: x** Choose the virtual extruder number which you need to set(x is from 0 to 15)
- **Control>>Mixer>>Mix>>Extruder1~4:** Adjust the percentage of extruder #1 to extruder #4, the range is 0 ~ 100.
- **Control>>Mixer>>Mix>>Comit:** Redistribute the percentage of all extruders in proportion and save it to the virtual extruder x.

Set mixing ratio by adding command

We can also add M163 and M164 command into the "Start G-code" of slicing software, to set the mixing ratio of the virtual extruder. Commands list as below:

```
M163 S0 Px      ; set the mix ratio of actual extruder #1, "x" is from 0 to 100
M163 S1 Py      ; set the mix ratio of actual extruder #2, "y" is from 0 to 100
M163 S2 Pz      ; set the mix ratio of actual extruder #3, "z" is from 0 to 100
M163 S3 Pn      ; set the mix ratio of actual extruder #4, "n" is from 0 to 100
M164 Sm         ; save the mix ratio of extruders to the "VTOOLm", "m" is from 0
to 16

For example, you added the below commands into the "Start G-code" of slicing
software
M163 S0 P10
M163 S1 P20
M163 S2 P30
M163 S3 P40
M164 S4
```

```
After that, the VTOOL4 has been set mix ratio "E1:E2:E3:E4 = 10:20:30:40". When
using VTOOL4, 4 actual extruders will feed
filaments in a ratio of 10:20:30:40.
```

📖Auto mixing color operation manual

The manual color mixing, gradient color mixing and random color mixing feature usually be used for printing models such as gradient vases. About the detail operation manuals, please refer to 📖**this guide**.

📖Mixed multi-color operation manual

For how to use a virtual extruder to print 3D models with more colors than the number of extruders, please refer to 📖**this guide**.
