Why does Klipper say extrude below minimum temp?

Asked 3D Content Team
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Abstract. Klipper blocks every extruder move while the hotend reads below min_extrude_temp, 170 °C by default. Usually a macro extruded before M109 finished heating.

Keywords: error-codes, firmware, hotends

1 Why does Klipper say extrude below minimum temp?

Klipper refused to turn the extruder because the hotend read below `min_extrude_temp`, 170 °C unless your config sets another value. Most often the start G-code or a macro extruded before the nozzle finished heating, because `M104` sets a temperature without waiting. Heat with `M109`, then extrude. No heater safety limit tripped.

1.1 The number

Table 1. The number

What	Value
`min_extrude_temp` default, Klipper v0.13.0	170 °C
Moves blocked	Any with an E (extruder) value, retraction included
Marlin 2.1.2.5 equivalent	`EXTRUDE_MINTEMP` 170 °C; skips the E part, logs `cold extrusion prevented`, keeps printing

The Klipper values come from its v0.13.0 configuration reference and klippy source; the Marlin row from `Configuration.h`, `planner.cpp` and `language.h` at release 2.1.2.5.

1.2 Why does Klipper refuse to extrude when the hotend is cold?

Below its printing temperature the filament in the nozzle is solid. Gears driven into it skip, as in a clicking extruder. In Prusa's words, they "grind away the filament, until they can't grab it anymore." So Klipper checks every move with an E value against the hotend's smoothed reading and rejects a cold one:

```
Extrude below minimum temp
See the 'min_extrude_temp' config option for
details
```

Klipper keeps running. A print from file stops and runs `on_error_gcode` (default `TURN_OFF_HEATERS`), and you can start again without `FIRMWARE_RESTART`.

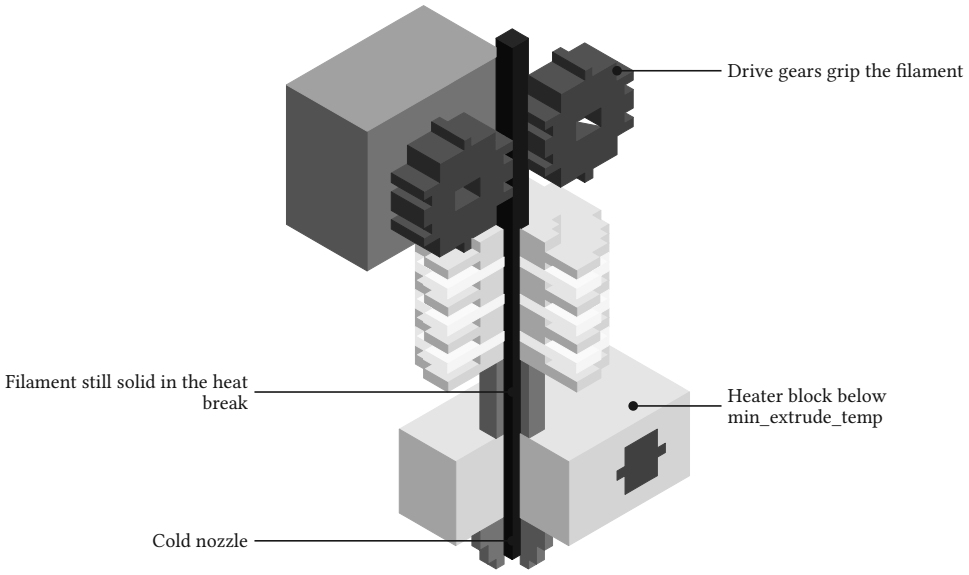


Figure 1. Below min_extrude_temp the filament is still solid down into the nozzle, so Klipper refuses any move that would drive the gears against it.

1.3 What causes it?

Check in this order:

1. **Start G-code extrudes too early.** `M104` sets the target and moves on; `M109` waits. A purge line after `M104` hits the check.
2. **A load or purge macro runs cold.** Give it its own `M109` before the first E move, or have it check `printer.extruder.can_extrude`.
3. **The print resumes after a long pause.** After 600 s idle, Klipper's idle timeout runs `TURN_OFF_HEATERS`, so `RESUME` extrudes into a cooling nozzle. Send `M109` before `RESUME`.
4. **The reading is low.** Review `sensor_type` and `sensor_pin`, as Klipper's configuration checks advise. A dead reading gives `ADC out of range` instead (MINTEMP errors).
5. **The print temperature is under 170 °C.** `M109` finishes, then the first extrusion fails.

1.4 How do I fix the start G-code?

Wait for both heaters before anything extrudes. Klipper's sample `START_PRINT` macro ends:

```
M190 S{BED_TEMP}
M109 S{EXTRUDER_TEMP}
```

Put the purge line after `M109`.

1.5 Can I lower min_extrude_temp?

Yes, for filament that prints below 170 °C, such as FormFutura's BioFil PCL (polycaprolactone) at about 95 to 130 °C. Set it in `[extruder]` just under your lowest print temperature and send `RESTART`. It must sit between `min_temp` and `max_temp`, the safety limits that shut the printer down when a reading leaves them. Don't lower it to hide a macro that extrudes too early.

1.6 How to check it on your own printer

- **Read the temperature graph at the error.** If the hotend sat below `min_extrude_temp`, a macro extruded too early. If it was at temperature, suspect the sensor or the setting.
- **Find the first E move.** Search the sliced file's start and your macros for an E move that comes before `M109`.
- **Check the value in use.** Search `printer.cfg` for `min_extrude_temp`, since a printer maker's config can set its own.

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