MAXXESHOP3D Resource Centre

Heat Creep in E3D-Style Hotends

Workshop Help, Diagnosis and Prevention Guide

This guide explains what heat creep is, where it happens inside an E3D-style hotend, how to diagnose it in a workshop or classroom setting, and why hotend-fan slowdown is one of the most common age-related causes. While the Prusa MK3S is used as a familiar example, the same hotend principles apply to many printers using a V6 or similar E3D-style hotend layout.

Workshop Warning

A hotend fan does not need to stop completely to cause heat creep. On older workshop printers, a fan may still spin but no longer move enough air across the heatsink. That reduced airflow allows heat to climb up the hotend and soften filament too early.

1. What is actually the hotend?

On many desktop 3D printers, the extruder assembly is the whole print-head system. It usually includes the drive gears, idler, motor, printed or metal mounting parts, hotend fan, part-cooling fan and the hotend itself. The hotend is only the thermal filament path assembly: heatsink, heatbreak, heater block, nozzle, heater cartridge and thermistor. On a Prusa MK3S this same distinction applies, but the description also fits most printers using a V6 or similar E3D-style hotend.

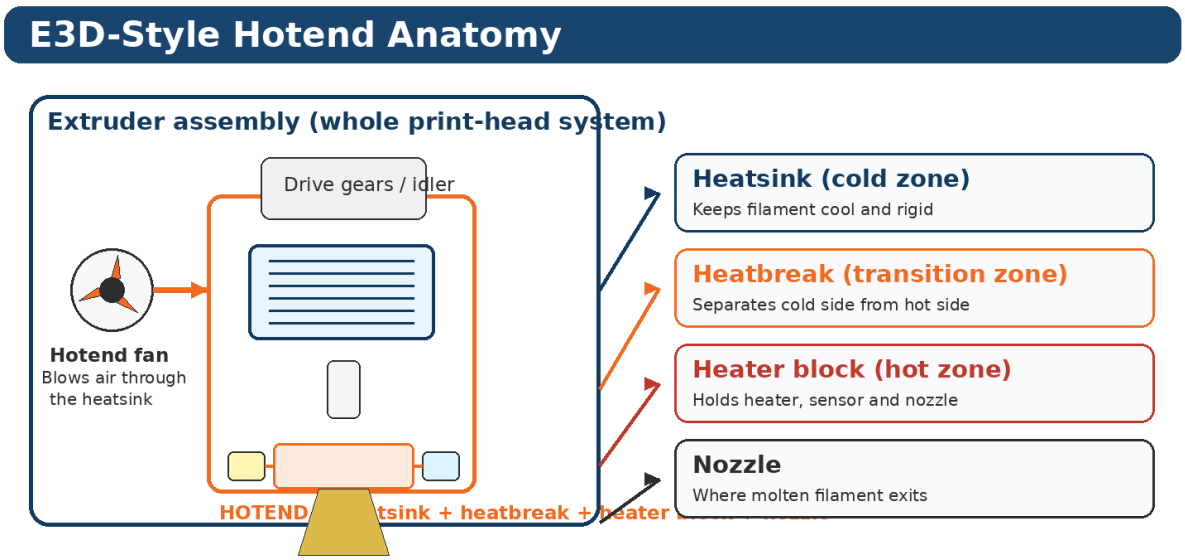

Figure 1. Simplified anatomy of an E3D-style print-head and hotend.

Cold zone	Transition zone	Hot zone
The heatsink is the cooled section. Its job	The heatbreak thermally separates the cold	The heater block and nozzle are the hot

is to keep filament solid and stable before it reaches the melting region.	side from the hot side. This is where the filament begins softening in a controlled way.	end of the system. This is where the filament becomes fully molten and exits the nozzle.

2. What is heat creep?

Heat creep happens when heat travels upward from the heater block into the heatbreak and heatsink region. When that happens, filament can begin softening too high in the path, swell inside the hotend, and jam before it reaches the nozzle correctly.

Common signs

- The print starts normally, then extrusion becomes weak or stops.
- The extruder clicks, skips or grinds filament.
- Problems are worse with PLA, longer prints, summer temperatures or enclosed printers.
- The fault can look like a clog, but the root cause is overheating higher in the hotend.

3. Symptom / cause / remedy

Symptom	Likely cause	Recommended remedy
Jams after the first few layers	Hotend fan not starting at 50°C, poor airflow across the heatsink, or fan wired / fitted incorrectly.	Preheat the printer and confirm the hotend fan starts at 50°C. Check orientation, wiring and airflow.
Random jams on longer PLA prints	Aging fan, dust buildup, warm room or enclosure heat pushing the cold side too warm.	Clean the fan and heatsink, open the enclosure if needed, and monitor room temperature.
Fan spins but heat creep still occurs	Fan is weak rather than fully failed, or the heatsink fins are blocked with dust.	Check RPM, listen for rough bearings, and clean or replace the fan before full failure.
Trouble begins after nozzle or hotend work	PTFE not fully seated, poor thermal contact at the heatbreak, or incorrect nozzle-to-block assembly.	Inspect the hotend assembly carefully and correct any seating or thermal-transfer issues.
Under-extrusion on thin, slow layers	Low filament flow allows heat to move upward because not enough filament is carrying heat away.	Test with slightly thicker layers or more typical flow settings to see whether the jam disappears.

4. Fast diagnosis steps

1. Preheat to PLA and confirm that the hotend fan starts once the nozzle reaches 50°C.
2. Check that the fan is blowing into and around the heatsink, not away from it.
3. During a print, view the nozzle-fan RPM in Support > Extruder Info. Low or unstable RPM is a warning sign.
4. Inspect the heatsink fins and fan blades for dust, lint or filament strands.
5. Review the environment: PLA, summer temperatures and enclosed printers all increase risk.
6. If the problem began after maintenance, inspect PTFE seating, heatbreak contact and nozzle assembly.

5. Prevention checklist for older workshop printers

☐	Clean the hotend fan and heatsink regularly, even before they look dirty.
☐	Replace noisy or slowing fans before they fail completely.
☐	Be extra cautious with PLA in hot rooms or enclosed printer setups.
☐	After hotend work, recheck PTFE seating and the nozzle-to-heater-block gap.
☐	Treat intermittent fan start-up as a real fault, not a minor inconvenience.

6. Source notes

This resource was prepared using official guidance from Prusa Research and E3D. Key reference points included Prusa's articles on heat creep and hotend fan behaviour, together with E3D's anatomy guidance for V6-style hotends used across many printers.

- Prusa Knowledge Base — "Extrusion stopped mid-print (Heat creep)"
- Prusa Knowledge Base — "Hotend fan is not spinning"
- E3D — "Anatomy of a 3D Printer HotEnd"

Quick takeaway: on most E3D-style hotends, the heater block is only one part of the hotend. Heat creep starts when the cooled side stops staying cool enough.