Roetz-End Build Manual v0.9 – BETA

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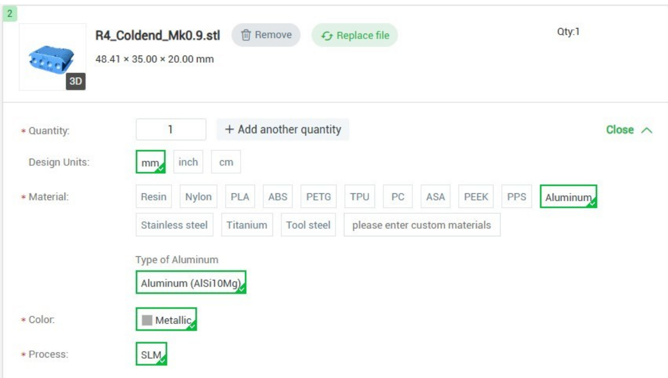
Repository: https://github.com/Roetz4point0/Roetz-End
Date: October 2025

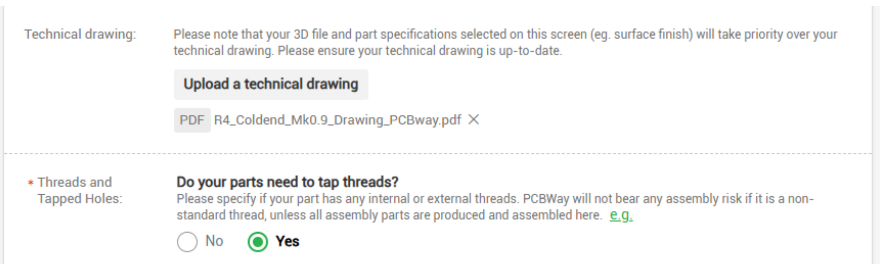
1. Introduction

The parts for the Roetz-end assembly can be aquired through different services. Fans, heatbreaks, heater, etc. are all standard parts and can be bought through provided link off of aliexpress or at your local 3d printer shop. The hotend and coldend can be 3d printed in the slm process – there are plenty of manufacturers to choose from. I’ll be showing a how to configure the parts on the PCBway website.

1.1 Download R4-PIE_Mk0.9.stl and R4_Coldend_Mk0.9.stl from the Files directory of the github.
1.2 Upload them to www.pcbway.com
1.3 If you want to cut threads/ check tolerances by yourself, choose the desired quantity and use the following material parameters: The price for both items should be around 70 USD.



1.4 If you want to have the fully threaded version, select the same material/quantity as in 1.3. On top, check „yes“ for threads and upload the corresponding technical drawing (R4-PIE_Mk0.9_Drawing_PCBway.pdf, Coldend_Mk0.9_Drawing_PCBway.pdf)which contains all neccessary information.
The price for both items should be around 150 USD.



2. Suggested Tools

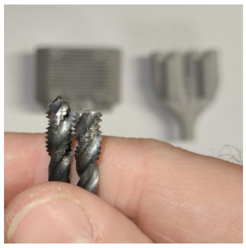
- M3 / M6 taps and tap wrench
- Ø 6 mm / Ø 2 mm reamers or drills
- Calipers
- Allen key set
- Pliers set
- Thread seal tape (PTFE)

3. Assembly Steps

🟨 Raw Version Preparation

Both SLM-printed parts are shipped straight from the machine.
Before assembly, you'll need to **cut all threads** and ensure that every accessory fits correctly.
The threads are already modeled into the Hotend and Coldend, so your tap will usually follow them naturally, but it is crucial that the heatbreaks M6 threads are in line with the melt channel bore.

Use **cutting oil** when tapping, but make sure to **remove all residue** before final heating or assembly.
If the heatbreaks do not seat fully, use a **bottoming (ground-off) M6 tap** to reach the very bottom of the threads.



All Ø6 mm holes must be large enough to accept both **heatbreaks and heater cartridges**.
If the fit is too tight from the machine, lightly run a **flat-ground 6 mm drill or endmill** through the bores until the components slide in smoothly.

🟧 Pre-Machined Version Preparation

Both the Hotend and Coldend have been **finished** to final tolerance.
All critical holes and threads are ready for immediate assembly — you do **not** need to re-tap or re-drill anything.

Before starting, visually inspect all threads and ensure they run freely.
If any chips or powder remain from post-processing, clean the parts with **compressed air** or a **soft brush**.

Check that your **heatbreaks** and **heater cartridges** slide in without resistance. Once verified, you can proceed directly with the main assembly steps.

Step 2 – Install Heatbreaks

1. Clean the hotend and channels with shop air or a strong vacuum.
2. Apply **PTFE tape** or high-temperature thread sealant to the M6 threads.
3. Thread in all **four heatbreaks** by hand until seated.
4. Heat the hotend to ≈ **250 °C** and retighten using **soft pliers** (you can use insulation tape around the jaws of the pliers)

5. Let the assembly cool to room temperature before continuing.
6. Dont screw in the nozzle – this will be the last step.

Step 3 – Install Heaters and Thermistor

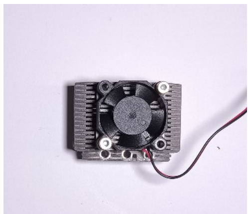
1. Insert the **Ø6 mm × 20 mm heater cartridges** into their respective bores. You can use thermal paste for maximum performance but it is not neccessary.
2. Mount the **thermistor** in the central bore and secure it with an **M3 screw.**

Step 4 – Join Hotend and Coldend

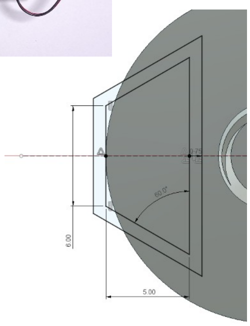
1. Align the **Coldend** and **Hotend** so the heatbreaks seat perfectly into their channels.
2. Insert the three **M3 clamping screws** and tighten them gradually in a cross pattern.

💡 *Tip:* A gentle amount of torque is enough to hold the hotend in place. If you overtighten and strip the threads you can use an M3 nut as a thread replacement.

Step 5 – Install Fan and Accessories



1. Mount the **30 × 30 mm cooling fan** to the front of the Coldend using M3 screws.
2. Attach sensors or ducts via the **side dovetail mounts** for height probes or additional cooling.



3. Design your dovetail counterparts with 6mm of throat opening, 60° of angle and 5mm depth or refer to: DIN 654 – D6

Step 6 – Electrical Connections

1. Connect all heater leads and the thermistor to your mainboard or a suitable external relay.
2. Double-check the **voltage rating (24 V)** and **total power draw (≈ 200 W)**.
3. Verify strain relief and cable routing before the first heat-up.
4. Check that the fan starts automatically when heating begins.

⚠ **Warning:** Always run initial tests under supervision — high-power heating elements can overrun quickly if the thermistor connection fails.

Step 7 – Calibration & Test Print

1. Heat the assembly slowly. The first heat will eventually burn off any oil left from thread cutting.
2. Load filament into all lanes. If run with empty lanes, molten material might push up other channels and clog the system.
3. Extrude some material and flush the system of last bits of powder from manufacturing.
4. Screw the nozzle in and torque it down while heated up.
5. Observe the melt flow and watch for leaks or uneven extrusion.
6. Run a **PID tune** at ~230 °C to stabilize temperature control.

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4. Technical Notes

- The Roetz-End operates as a high-flow multi-filament hotend capable of up to **200 mm³/s** material throughput. The stated flow rate is achieved with Fiberlogy HS Pla @ 250°C @ 1mm nozzle. Results may vary, there is only very limited data points availiable until now.
- Recommended heater configuration: **4 × 24 V / 50 W** cartridges, controlled parallel via solid-state relay.
- Thermistor type: **NTC 100 K (B3950)** or equivalent.
- All melt channels are independent and feature direct filament paths for clean material separation.
- Standard nozzle interface: **M6 × 1 mm**, compatible with all common RepRap-style nozzles.
- Dovetail accessory mounts follow **DIN 654 – D6 (60°)** geometry, 6 mm throat, 5 mm depth.
- Recommended material for SLM parts: **AlSi10Mg** or similar heat-conductive aluminum alloy.
- For best results, use **Klipper** or recent **Marlin** firmware with *pressure advance* or *linear advance* enabled.
- Avoid overtightening M3 screws in aluminum — torque ≈ 1 Nm maximum.

5. Maintenance

- **Inspection:** Check all mechanical fasteners, wiring and connectors after the first hour of operation and then periodically every 50 hours.
- **Cleaning:** Keep the nozzle and the cooling fins free of plastic residue and dust. Use brass brushes or non-abrasive cloth only.
- **Fan service:** Ensure the 30 mm fan spins freely; replace if bearing noise increases.
- **Heater replacement:** Always disconnect power before removing heater cartridges. Reapply thermal compound if reused.
- **Re-sealing:** When disassembling, replace PTFE tape or thread sealant on heatbreaks to maintain tight sealing.
- **Calibration:** Re-run PID tuning and flow tests after every major rebuild or part replacement.

6. License & Credits

📜 License & Credits

Project: Roetz-End – Directional Material Deposition (Beta)
Author: Jan Roetz / Roetz 4.0
Year: 2025
Repository: github.com/Roetz4point0/Roetz-End
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Disclaimer

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The Roetz-End is an experimental open-source hardware project provided as-is without warranty of any kind.

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Ensure compliance with electrical, mechanical, and thermal safety standards applicable in your region.

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