

PCB FACTORY PRE-FLIGHT & MANUAL ETCHING MANUAL

Thermostat Controller • REV A • 90 × 40 mm • 2-layer FR-4 target

Purpose: Use this document before sending PCB data to a factory or before making a prototype by manual etching. It separates the production-data checks from the physical etching process.

1. Factory submission — mandatory pre-flight

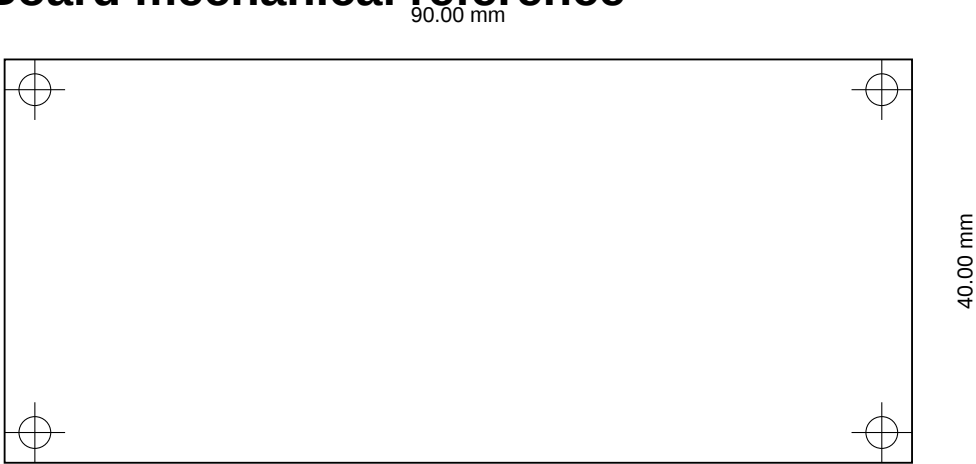
Check	Required result
Original KiCad PCB	Upload the verified .kicad_pcb for true KiCad DRC.
Schematic/netlist	Schematic and PCB must be synchronized; no unresolved connections.
KiCad DRC	Run with the exact factory rules/clearances; resolve violations.
Gerbers	F.Cu, B.Cu, F.Mask, B.Mask, F.Silk, B.Silk, Edge.Cuts present.
Drill	Excellon PTH/NPTH drill files present and verified.
Board outline	90.00 × 40.00 mm; corners and mounting holes verified.
Stackup	2-layer FR-4, target 1.6 mm, 1 oz copper unless factory approves otherwise.
Finish	Select lead-free HASL or ENIG and confirm with factory.
Silkscreen	Reference designators and polarity marks readable.
Final archive	ZIP contains only the approved REV A manufacturing data.

Important: A Gerber archive alone cannot prove KiCad netlist/clearance/unconnected-net DRC. For genuine DRC, keep the original .kicad_pcb and run kicad-cli/desktop KiCad before submission.

2. Production file package

File/data	Purpose
*.kicad_pcb	Source PCB for KiCad DRC and future revision.
*.kicad_sch	Source schematic, if supplied to the factory/engineering archive.
*.gtl	Front copper (F.Cu).
*.gbl	Back copper (B.Cu).
*.gts / *.gbs	Front/back solder mask.
*.gto / *.gbo	Front/back silkscreen.
*.gm1 / approved outline	Board profile / Edge.Cuts.
*.drl	Excellon drilling data.
FAB drawing / PDF	Dimensions, stackup, holes, notes and revision.

3. Board mechanical reference



Target: 2-layer FR-4 • 1.6 mm • 1 oz • 4 × Ø3.20 mm mounting holes
Hole centers: (3,3), (87,3), (3,37), (87,37) mm

The drawing above is a mechanical reference, not a replacement for the final KiCad Edge.Cuts and drill data.

4. Manual etching — prototype only

- **1 — Verify artwork.** Print the final copper layer at 1:1 scale. Confirm the 90 × 40 mm outline and all hole positions with a ruler/caliper.
- **2 — Transfer.** Use toner-transfer film or a photoresist process suitable for the selected copper-clad board. Keep the copper image orientation correct for the chosen transfer method.
- **3 — Drill reference holes.** For a prototype, drill mounting and through-hole locations only after the transfer/etch process if the artwork requires it.
- **4 — Etch.** Use the etchant and concentration specified by its manufacturer. Wear chemical-resistant gloves and eye protection, provide ventilation, and use a compatible plastic container.
- **5 — Rinse and inspect.** Stop the etch, rinse thoroughly, and inspect every trace for undercut, opens and shorts.
- **6 — Remove resist.** Remove toner/photoresist using the process recommended for the transfer material.
- **7 — Drill and deburr.** Drill component and mounting holes to the verified drill sizes. Remove burrs without damaging copper.
- **8 — Continuity test.** Check critical nets with a multimeter and check for shorts between adjacent conductors.
- **9 — Tin/protect copper.** Apply an appropriate prototype finish if desired. Do not treat a hand-etched board as a safety-certified mains PCB.

Safety: Chemical etching can cause burns and harmful fumes. Follow the chemical manufacturer's SDS and disposal rules. Never discharge used etchant into household drains. For mains-voltage products, use professionally fabricated PCB material with verified creepage/clearance and safety certification requirements.

5. Final release gate

Gate	PASS when...
Design	All intended components and nets are present.
Footprints	Exact purchased part footprints match datasheets.
DRC	KiCad reports no unresolved production violations.
Gerber	All layers match the approved PCB revision.
Drill	Hole table and drill files match the PCB.
2D render	No missing copper, mask or outline features in the visual review.
Factory quote	Stackup, finish, thickness and quantity are confirmed.
Revision	All submitted files are labeled REV A and archived together.

Document: PCB_FACTORY_PRE_FLIGHT_AND_ETCHING_MANUAL_REV_A.pdf • Reference design: thermostat controller REV A