User Manual

Document 11 | Rev C | 17 November 2026 | Status: design package. Nothing has been built or bench-tested; numbers are design targets, calculations or simulations. Draft written from the design; to be corrected against a real machine.

Read section 1 before plugging in. This manual was written from the design files before any machine was built. Treat every procedure as a draft until it has been checked on a real unit.

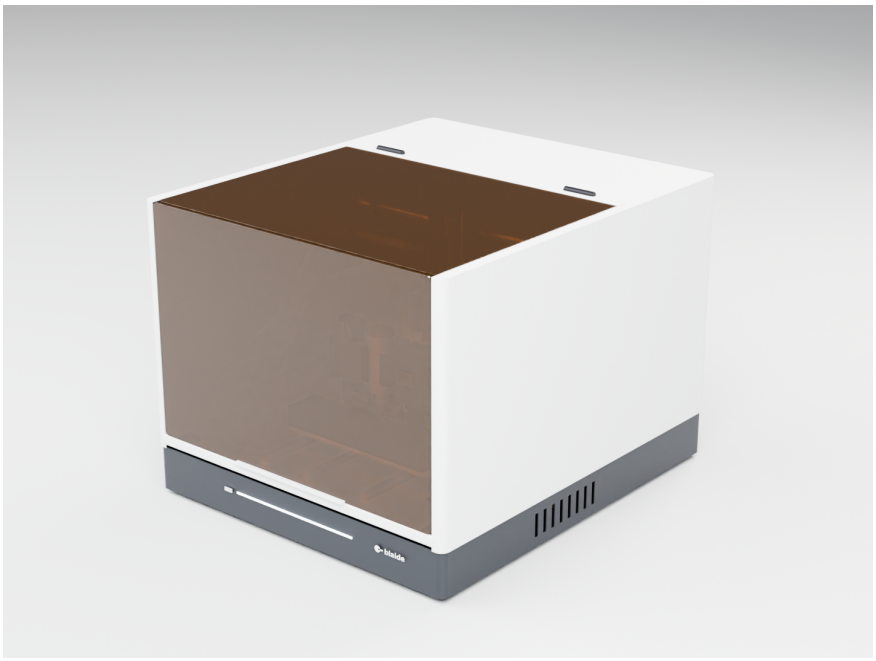
1. Safety

- **Laser.** The laser tool emits 405 nm light that can injure eyes. It only runs with the lid closed. Never defeat the lid switches, and never run the machine with the lid panel cracked or missing.
- **Spindle.** The milling tool spins small bits that can break. Keep the lid closed while it runs and wear eye protection when changing bits.
- **Hot bed.** The bed reaches up to 245 C and stays hot for about 33 minutes after a job. An amber light line means hot. Do not touch the bed or a board until the line returns to white.
- **Fumes and dust.** Inks, flux and milled board dust are irritants. Keep the filter fitted, use the machine in a ventilated room, and do not mill boards without the filter.
- **Chemicals.** Follow the safety sheet supplied with each cartridge. Recipe C needs a developer and an etchant that you supply and handle yourself.
- **Electricity.** Unplug before opening the base. There are no user-serviceable parts under the deck.
- **Stopping.** Lift the lid to stop the laser, spindle and heater at once. Hold the button for 1.5 seconds to stop a job. The rear switch removes all power.

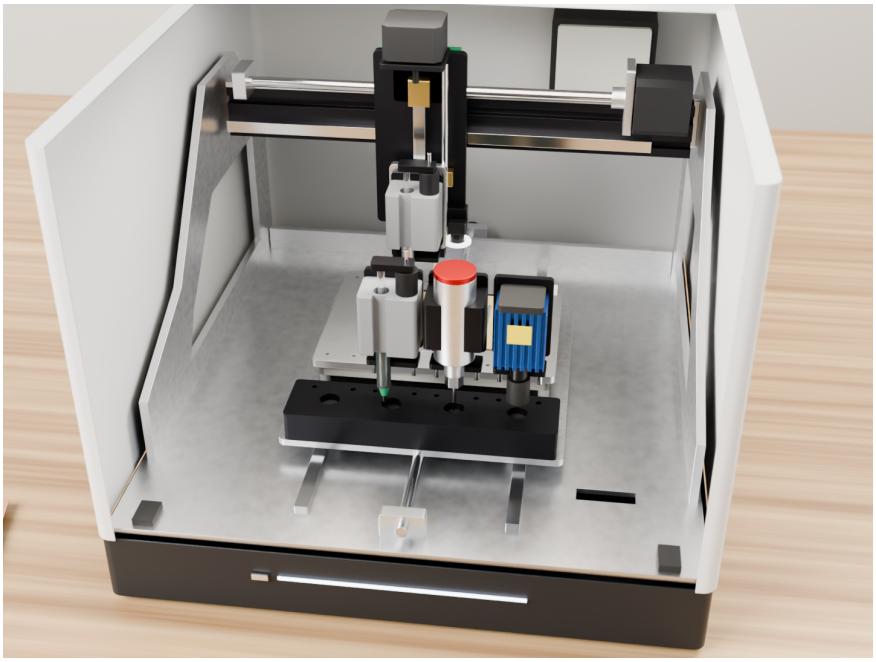
2. What is in the box

Item	Qty
Printer with two dispensers, spindle and laser tool on the dock	1
Power lead	1
Calibration target	1
Sacrificial sheet (fitted)	1
Copper-clad blanks, 100 x 80 mm	5
Print-base blanks, 100 x 80 mm	5
Silver, dielectric and solder paste cartridges	1 each
Nozzles, three sizes	30
Engraving bit, drills (0.6, 0.8, 1.0 mm)	1 + 3
Swabs, tip caps	20

3. Getting to know it



Part	Where	What it does
Light line	Front of the base	Shows state and progress (section 5)
Button	Left end of the light line	Tap: start, pause, resume. Hold 1.5 s: stop
Lid	Front and top	Lift by the lip along the front edge. Opening it stops the laser, spindle and heater
Power switch and inlet	Rear right	Mains on and off
Filter cartridge	Rear	Slides out upward
Tool dock	Front edge of the bed	Four parked tools; the machine swaps them itself
Board holder	On the bed	Fixed corner at the back left, two spring pushers
Camera and light	On the carriage	Alignment, cartridge tuning, inspection



4. Setting up

- Put the printer on a level, sturdy bench with 100 mm clear behind it for the exhaust and room to lift the lid fully.
- Remove the transport clip from the bed and the foam from under the carriage.

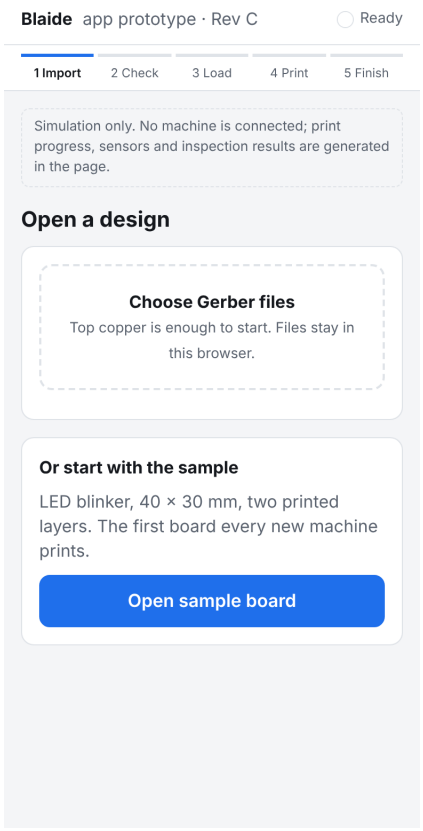
- Plug in and switch on at the rear. The light line sweeps blue while the axes find home, then settles to dim white.
- On a phone or computer, join the Wi-Fi network named on the label under the lid, then open the address printed there. The app asks for your own network's name and password so the printer can join it.
- Run **Calibrate** from the app menu. The machine measures its camera, each tool's position and the bed height by itself. It takes about ten minutes.
- Fit a cartridge in each dispenser (section 8).

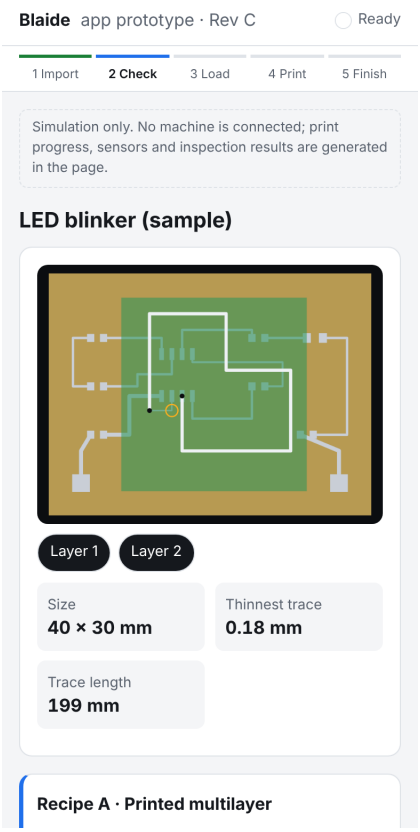
5. The light line

You see	It means	What to do
Dim white, steady	Ready	Send a job
Blue band sweeping side to side	Finding home or measuring the board	Wait
Amber band sweeping	Bed heating or cooling	Wait. The bed is hot
Blue line filling from the left	Job running. The filled length is the progress	Nothing
Amber, slowly breathing	The machine needs you	Look at the app: flip the board, wipe a tip, change a cartridge or close the lid
Red, steady	Fault. All power outputs are off	Read the message in the app (section 11)

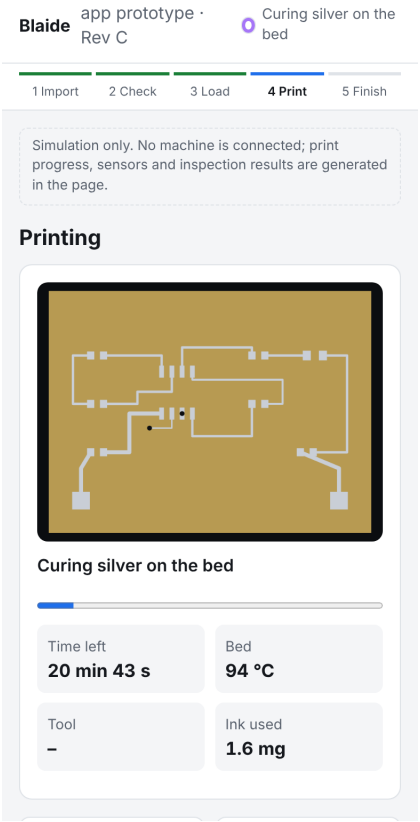
6. Making a board, step by step

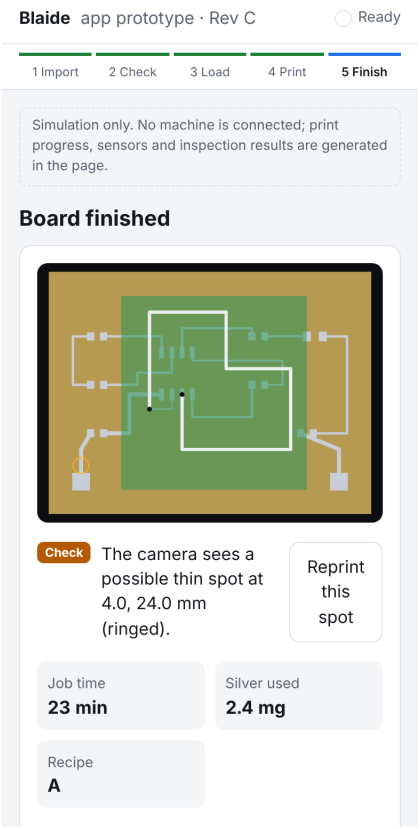
The app has five steps. The pictures are from the app simulation supplied with this package.





- **Open.** Drop your Gerber and drill files onto the page, or choose Send to Blaide from KiCad's Tools menu. The app sorts the layers by itself.
- **Check.** Every layer is drawn. Anything too fine for the chosen recipe is listed in plain words with its position; where there is a safe automatic fix, a button applies it. Pick the recipe and how many copies to fit on one blank.
- **Load.** Lift the lid. Slide the blank into the back-left corner of the holder, pull each pusher back, and let it close on the board edge. Tick the three checks in the app and close the lid.
- **Print.** Tap Start in the app or tap the button. The machine measures the board height, picks up each tool in turn, and works through the layers. It pauses and breathes amber only when it needs you.
- **Finish.** The camera compares the board with your design. A ringed spot is something it doubts; tap Reprint this spot to repair it. When the line is white, lift out the board.





7. The four recipes

Recipe	Use it for	You do	The machine does
A. Printed silver	Fast one or two-layer boards, flexible film, up to four layers	Load a print-base blank. Flip if asked	Prints silver, cures it on the bed, prints dielectric where layers cross, cures with UV, repeats; then paste

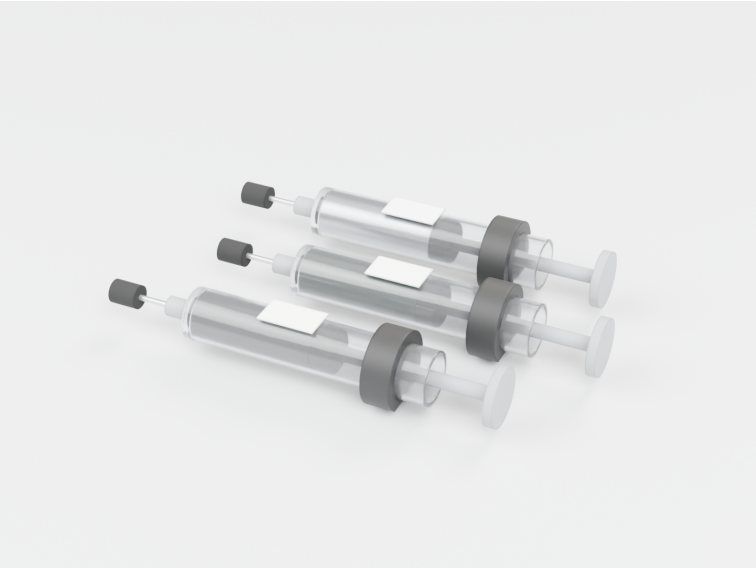
Recipe	Use it for	You do	The machine does
B. Milled copper	Boards that need real copper and higher current	Load a copper blank. Vacuum the dust afterwards	Engraves around every trace, drills holes, cuts the outline
C. Exposed copper	Finest detail, down to 0.1 mm	Load a pre-coated blank in dim light. Develop and etch it yourself afterwards	Draws the pattern in the photoresist with the laser, then drills after etching if you reload it
D. Hybrid	Copper board with printed extras such as jumpers or mask	As B or C, then reload	Aligns to the existing copper by camera and prints on top

Two-sided boards. When the app says Flip, lift the lid, turn the board over left to right, and push it back into the same corner. The camera finds the board again and lines the second side up with the first; you do not need to measure anything.

Copies. On the Check step choose 2 x 1 or 2 x 2 to fill the blank with copies. Time and ink scale with the number.

Parts. After the copper or silver is done the machine can dispense solder paste on the pads. Place the parts with tweezers, close the lid, and choose Reflow. Wait for the white line before lifting the board.

8. Cartridges



- Each cartridge has a collar with one flat side and a small tag the machine reads. It fits one way only, and the machine sets flow and curing for that ink by itself.
- **To fit:** lift the lid, pull the old cartridge straight up out of the dispenser, remove the cap from the new one, and lower it in with the flat side facing you until it clicks. The app prints a short test line and measures it with the camera to set the flow.
- **Storage:** keep silver inks and solder paste in a fridge, capped, tip up. Note the use-by date on the label; old ink prints thin and may not conduct.
- **If the app says Ink flow dropped:** the tip is drying. Wipe it with a swab and tap Continue. The machine primes on the purge pad and reprints the last 2 mm.
- **If it says Cartridge empty:** fit a new one and tap Continue; the job carries on from where it stopped.
- An unrecognised cartridge is not refused. The app asks you for the settings instead.

9. Care and maintenance

When	What	How
After every ink job	Cap the nozzle	Push a tip cap on; wipe the tip first

When	What	How
When the app prompts (about 40 m of milling)	Change the engraving bit	Lift the lid, loosen the collet with the supplied key, swap the bit to the depth mark
When the app prompts (about 15 jobs)	Change the sacrificial sheet	Lift the holder pushers, slide the old sheet out, slide the new one in
When the app prompts (about 150 hours)	Change the filter	Slide the cartridge up and out at the rear; fit the new one arrow down
Monthly	Clean the rails and screws	Dry lint-free cloth only. Do not oil
Monthly, or after moving the printer	Calibrate	App menu, Calibrate
If lines look wrong	Re-tune the cartridge	App menu, Cartridge, Test line

10. If the power goes off

The machine saves its place many times a second. When power returns the app shows Power came back with the step and percentage. Tap Resume: the machine finds home again, checks with the camera that the board has not moved, and continues. If the board has moved it tells you and asks whether to realign or stop.

11. Troubleshooting

Symptom or message	Likely cause	What to do
Nothing lights up	No mains, or rear switch off	Check the lead and the switch
Will not start; app says lid open	Lid not fully down	Press the front edge of the lid until both sides seat
Printed lines too wide or blobby	Flow too high, or board height not measured	Run the cartridge test line; check the board is flat in the holder
Printed lines broken or thin	Drying tip, old ink, or flow too low	Wipe the tip; check the use-by date; run the test line
Milled traces ragged	Worn or chipped bit	Change the bit
Second side misaligned	Board not pushed into the corner after the flip	Reload, push firmly into the back-left corner, choose Realign
Camera inspection rings many spots	Dust on the lens or board	Wipe the lens with a dry swab; blow dust off the board
Red line: bed sensor	The two bed sensors disagree	Switch off, let it cool for 40 minutes, try again. If it repeats, stop using the heater and contact support
Red line: motion	An axis could not move	Switch off, check nothing is fouling the bed or bridge, switch on
Red line: watchdog	The controller stopped responding	Switch off for ten seconds and on again
App cannot find the printer	Different Wi-Fi network	Join the same network as the printer, or rejoin the printer's own network and set it up again

12. Specifications

Parameter	Target	Basis
Board area	150 x 110 mm	CAD travel
Envelope	400 x 460 x 330 mm	CAD
Mass	16 kg	CAD model volumes
Travel X / Y / Z	194 / 188 / 45 mm	CAD; firmware limits match
Resolution	1.25 um per microstep (800 steps/mm)	firmware config
Max speed XY / Z	100 / 20 mm/s	firmware config
Acceleration XY	1500 mm/s2, jerk limited to 375,000 mm/s3	simulation D
Positioning accuracy XY	0.072 mm combined (target 0.1 mm)	accuracy budget
Tools	2 dispensers, spindle, 405 nm laser; automatic change	CAD

Parameter	Target	Basis
Minimum trace / gap	0.20 / 0.20 mm printed and milled; 0.10 / 0.10 mm laser-exposed	CAM limits
Printed layers	up to 4, with printed dielectric	CAM
Bed	200 W, firmware limit 245 C, thermal fuse 260 C	firmware config

13. Words used

Word	Meaning
Blank	A board before anything is printed, milled or exposed on it
Cure	Heating or lighting an ink so it hardens and, for silver, conducts
Dielectric	An insulating ink printed between two silver layers where they cross
Fiducial	A small mark the camera uses to find the board's position
Gerber files	The standard files a circuit design program exports for making a board
Recipe	One of the four ways of making a board
Reflow	Heating a board so solder paste melts and fixes the parts
Via	A hole that connects the two sides of a board