AMOS GrblForge

User Manual

Version 0.9.0

CNC Router & Laser Control Suite

About this manual

AMOS GrblForge is a design, control and machining suite for GRBL-based CNC routers and laser engravers. It takes a job from a blank sheet to a finished part: draw or import artwork, assign cutting operations, generate the program, and run the machine.

This manual covers version 0.9.0. It assumes you know your own machine — how it is wired, where its limits are, and what it is safe to cut. The software will not save you from a machine that is set up wrongly.

The one rule

Never leave a running machine unattended, and never rely on software to stop it. A router and a laser are both perfectly capable of ruining a workpiece or starting a fire while every number on screen looks correct. Keep the physical emergency stop within reach and use it first — the STOP button in this software asks the controller to halt, which is not the same thing as cutting the power.

Everything else in this manual assumes that rule is already in place.

Setting up your machine

Do this once, before anything else. Almost every confusing result later traces back to a profile that does not match the machine.

Create a machine profile

Open **Machine profiles** from the toolbar (the icon beside the machine selector). Create a profile and fill in:

- **Name** — whatever you call the machine.
- **Type** — Spindle, Laser, or Hybrid if the same machine does both.
- **Work envelope** — X, Y and Z travel in millimetres. Measure it; do not guess. This is what out-of-bounds checking compares against.
- **Serial port and baud rate** — usually 115200.
- **Homing** — whether the machine has limit switches and homes, and to which corner.
- **Maximum spindle RPM** and **maximum laser S value** — the S value is your controller's `$30` setting, commonly 1000.
- **Tool-change position** and **park position** — machine coordinates the machine travels to when changing tools or parking. Leave blank if you do not use them.

Several profiles can coexist. Switch between them with the machine selector in the toolbar.

Connect

Pick the profile, then connect. The status panel shows the state — **Idle**, **Run**, **Hold**, **Alarm** and so on — and the firmware version once the controller answers.

If the machine has homing enabled it will usually start in **Alarm**. Home it (`$H`) rather than unlocking it. Unlocking clears the alarm but does not establish where the machine actually is, so soft limits and saved positions cannot be trusted afterwards. The pre-flight check will warn you about this.

CNC or Laser

The **CNC ROUTER** and **LASER** buttons in the toolbar switch the whole workspace between the two. This changes which operations are offered and how the program is written.

Individual layers also carry their own assignment. If you are in laser mode but a layer still offers router operations, open that layer's menu and choose **Burn with the laser**.

The workspace

The left rail

The icons down the left edge switch what the left panel shows:

Section	What it is for
Project	Project name, material, stock size, job origin, Z work plane, units
Edit	Undo, redo and the editing tools
Images	Importing artwork and photographs
Vectors	Drawing, combining, node editing, measuring, placing tabs
Text	Adding and shaping text
Shapes	Rectangles, ellipses, circles, polygons, stars, lines
Layers	The layer stack
Toolpaths	Generating and reviewing the program
Machine	Connection, settings, profiles
Simulation	Watching the job run before you cut it
Console	The raw conversation with the controller
Help	Shortcuts, diagnostics, updates

The canvas

The middle of the window. Tabs across the top switch between **2D View**, **3D View** and **Simulation**.

The orange rectangle is your stock. The red crosshair is work zero. Rulers run along two edges, and the toolbar above offers grid, snap, grid spacing, zoom to fit, zoom to selection, guides and the measuring tool.

The right-hand panels

- **Layers & Operations** — the layer stack. Each row has an eye (visible on the canvas), an output square (included in the job), a colour, a name, and the operation it will cut with.
- **Layer Parameters** / **Object Properties** — the panel below changes depending on what is selected. Select an object and it shows that object's position, size and type-specific settings; select nothing and it shows the current layer's cutting parameters.
- **Toolpaths** — Generate Toolpaths, estimated time, and per-layer warnings.
- **3D Preview** — the carve, the material, the toolpath and the design as separate toggles.
- **Machine Status** — state, work and machine position, feed, spindle, active tool, coordinate system, and the limit, probe and door inputs.
- **Machine Control** — jogging, position, macros, overrides, and the RUN / PAUSE / STOP controls pinned at the bottom.

Your first job, end to end

Cutting a simple shape out of a piece of wood. Every job follows this shape, however complicated it gets.

1. New project. Ctrl+N. Pick a template — **Blank** to start from nothing, or one of the ready-made ones such as **Sign**, **Plaque** or **Profile cutting**, which arrive with layers and operations already set up.

2. Describe the stock. In **Project**, set the width, height and thickness of the material you have clamped down. Pick a **Material** so feeds and speeds start somewhere sensible.

3. Set the job origin. The 3×3 grid says which part of the stock work zero sits on. The little block beside it shows where that lands. Under it, **Z zero** says whether you touched off on the *material top* or on the *bed / spoilboard* — getting this wrong is the difference between a 3 mm pocket and a cutter buried in your spoilboard.

4. Draw or import. Add a shape from **Shapes**, or import a file — drag it onto the window, or use **Import**.

5. Give the layer an operation. In **Layers & Operations**, choose an operation from the dropdown on the layer row. To cut a shape out, that is **Profile Cut (Outside)**.

6. Assign a tool. In **Layer Parameters**, on the **Tool** tab, choose the cutter. Feeds, speeds and diameter come from the tool library.

7. Set depth and tabs. On the **Operation** tab set the cutting depth — usually the material thickness plus a little — and the stepdown. Switch **Tabs** on for a part that would otherwise come loose and be thrown.

8. Generate. Press **Generate Toolpaths**. The canvas shows the paths and the panel shows an estimated time. Read any warnings; they are there because something does not add up.

9. Check it. Open the **Simulation** tab and watch it cut. This is free, and it is the last point at which a mistake costs nothing.

10. Set work zero on the machine. Jog to the corner you chose in step 3, then zero X and Y. Touch off Z on the material — by eye, with a piece of paper, or with the probe wizard.

11. Pre-flight and run. Press **RUN**. The pre-flight checklist appears. Read it, clear anything blocking, then start.

Stay with the machine while it cuts.

Designing and importing

Drawing

Shapes offers rectangle, ellipse, circle, polygon, star and line. Pick one and drag on the canvas.

Vectors is where shapes become geometry: combine two shapes (union, difference, intersection), offset a path, convert a shape to an editable path, edit its nodes, align and distribute, measure a distance, and place tabs by hand.

Text

Text adds type using the fonts installed on your computer. The font picker has a search box, and a star to pin the ones you use often.

Beyond size and alignment you can set **tracking** (space between letters), **line spacing**, **vertical** stacking, and run text along a path — pick any path object under **Follow**, slide where it starts, and flip it if it comes out upside down along the top of a circle.

Single-line engraving cuts down the middle of each stroke instead of around the outside of the letters. That is what an engraving bit wants: one pass per stroke.

Text is machined as its real letterforms. **Convert to Path** turns it into editable outlines, after which it is no longer editable as text.

Importing

Drag a file onto the window, paste an image from the clipboard, or use **Import**.

Format	What happens
SVG	Vector paths, at the size the file declares
DXF	Vector entities, at real-world size
PDF	The page's vector paths. Text in a PDF is drawn from embedded fonts, not outlines, so it cannot be imported — re-export with text converted to outlines
PNG, JPG, BMP, GIF, WebP	Placed as an image, ready to trace or engrave
TIFF	The same, placed at its real size if the file records a scan resolution
STL, OBJ	A 3D model, projected into a relief you can machine
G-code (`.nc`, `.gcode`, `.tap`, `.ngc`)	Loaded to the machine exactly as written — nothing is regenerated

Images

An imported picture can be adjusted — crop, straighten, brightness, contrast, levels, sharpen, blur, denoise, posterise, greyscale, invert, edge detect, remove background — and then either engraved directly or **traced** into vector paths you can cut.

3D models

A router reaches only what is visible from straight above, so an STL or OBJ is projected into a top-down height map and cut as a relief. Undercuts cannot be reached and are flattened away; the import tells you so. The relief depth is set from the model's real height.

Layers and operations

A layer holds artwork and one operation. Everything on that layer is cut that way. A part that needs a pocket, some lettering and an outline is three layers.

Each layer row has an **eye** (shown on the canvas) and an **output square** (included in the job) — a layer can be visible but not cut, which is how you keep a reference drawing on screen without machining it.

The layer menu also offers isolate, hide or lock the others, merge down, split the selection to a new layer, grouping, and switching the layer between router and laser.

Router operations

Operation	What it does
Profile Cut (Outside)	Cuts around the outside of a shape, leaving the shape
Profile Cut (Inside)	Cuts around the inside, leaving the hole

Operation	What it does
Profile (On-Line)	Follows the line itself, no offset
Pocket	Clears the whole inside of a closed shape
Adaptive Clearing	Clears a pocket with a small bite at full depth — easier on the tool and much faster in hard material
Drill / **Peck Drill**	Holes at the centre of each shape; peck retracts to clear chips
V-Carve	Varies depth so a V-bit follows the shape of the letters — the classic carved sign
Engrave	A shallow pass along the line
Centerline Engrave	One pass down the middle of a shape rather than around it
Raster Engrave	Scanline engraving
Facing / Surfacing	Flattens a surface or skims a spoilboard
Stone / Dot Engraving	A photograph as a field of pecked dots
Slot	Follows a line, widened to a slot width
Chamfer	Breaks an edge with a V-bit
Inlay	The cavity and the plug of an inlay pair, from the same artwork
3D Relief (raster finish)	Follows a height map with a ball nose — smooth, slow
2.5D Relief (stepped contours)	The same shape as stepped levels — faceted, and a flat endmill will do

Laser operations

Operation	What it does
Line	A single pass along the path
Vector Engrave	A light pass that marks rather than cuts
Vector Cut	Through the material
Fill, **Hatch**, **Cross Hatch**	Fills a closed shape with scan lines, one or both directions
Raster Image	A photograph, line by line
Grayscale Image	Power varies with brightness
Dithered Image	Black and white dots, with a choice of dithering pattern
Centerline	Down the middle of a shape
Mark	A light marking pass

Operation parameters

Select a layer with nothing else selected and the **Layer Parameters** panel shows its settings across three tabs: **Operation**, **Tool** and **Feeds & Speeds**. Edit, then press **Apply**.

Router

Setting	What it means
Depth	How deep the finished cut goes
Start depth	Where cutting begins. Above zero skips material a previous operation already removed
Stepdown	How much each pass takes off. Deeper is faster and harder on the tool
Stepover %	How much of the cutter's width each pass removes, when clearing
Rapid height	Height for hops between nearby cuts. Zero uses safe Z for everything
Plunge	*Straight* drops vertically; *Ramp* descends along the path; *Helix* spirals down a closed shape. Ramp or helix for any bit that cannot plunge
Stock to leave	Material left on the walls for a finishing pass
Finish pass	A final pass at finished size
Tabs	Small bridges holding a cut-out part in place. *Square* steps up onto each tab; *Ramped* climbs and descends, which is kinder to the tool. Keep them off corners — a corner tab tears out
Climb / conventional	Which way round the cutter travels
Lead in/out	Enters and leaves off the finished edge rather than dropping onto the cut line
Rest machining	On a pocket, clears only what a previous larger cutter could not reach

Laser

Setting	What it means
Speed	How fast the head travels
Min / max power	As a percentage of the machine's maximum
Passes	How many times to repeat
Line interval	Spacing between scan lines when filling or rastering
DPI	Raster resolution
Overscan	Extra travel past each end of a scan line, so acceleration does not darken the edges
Air assist	Switches the air on for the layer
Focus offset	Moves Z off the focused height before cutting, and puts it back afterwards
Power mode	*Dynamic* scales power with the actual speed, so corners do not burn darker. *Constant* holds it steady

Relief

Relief depth is how deep the darkest part cuts. **Model pitch** is the resolution of the height model — finer is slower, not always better. **Pass spacing** and **direction** control the finishing passes. **Invert** treats dark as high instead of low.

The path is worked out for the tool you assigned: a ball nose cannot reach into a valley narrower than its own radius, and the software will not pretend otherwise.

Tools and materials

The tool library

Open it from the toolbar. Each tool records its number, name, type, cutting diameter, flute count, cutting and overall length, included angle and tip diameter for V-bits, maximum and default RPM, feed, plunge, stepover, stepdown, manufacturer, part number and notes.

Types: flat end mill, ball nose, V-bit, engraving bit, tapered ball nose, drill, compression, up-cut, down-cut, surfacing bit, custom.

The diameter is not cosmetic. It decides how far a profile is offset from your line, how far apart pocket passes sit, and whether a cutter can reach into a corner at all. **Measure your cutters** — the printed diameter is often optimistic, and a tenth of a millimetre shows up as a part that will not fit.

Assign a tool on the **Tool** tab of Layer Parameters. Its feed, plunge and RPM become the layer's defaults.

Materials

The material library ships with presets for hardwood, softwood, MDF, plywood, acrylic, generic plastic, foam, leather, anodised aluminium, coated metal, slate, glass, cardboard and paper. Each carries suggested router feeds and speeds, laser speeds and powers, or both.

Choose a material in **Project** and it seeds sensible starting numbers. They are starting numbers — your machine's rigidity, your cutter's sharpness and the particular board in front of you all matter more than a table. Cut a test piece.

You can add your own materials, and they travel with backups and packaged projects.

Work origin and probing

More ruined workpieces come from this than from anything else in the manual.

Two coordinate systems

Machine coordinates are fixed to the machine and established by homing. **Work coordinates** are where *your job* starts — the corner of the material you touched off on. The status panel shows both.

The job origin

In **Project**, the 3×3 grid says which part of the stock work zero sits on: a corner, an edge midpoint, or the centre. The stock moves on the canvas relative to the fixed red crosshair, and the little block beside the grid shows the same thing in three dimensions.

Pick whichever matches how you will touch off on the real machine. Bottom-left is the usual choice for a router; centre is common for a laser.

Z zero: the work plane

Underneath, **Material top** and **Bed / spoilboard** say which surface Z zero sits on.

- **Material top** — you touched the cutter on the surface of the workpiece. Cuts go down from zero. This is the usual case.

- **Bed / spoilboard** — you touched off on the bed underneath. Every Z is lifted by the material thickness to compensate.

Get this wrong and a 3 mm pocket becomes a cutter buried in the spoilboard. Set the stock thickness accurately, because that is the number the compensation uses.

Setting zero by hand

Jog to the corner you chose, then use **Set XY 0** or **Set XYZ 0** in the Position tab or from a macro. For Z, lower the tool until it just grips a slip of paper, then zero Z.

The probe wizard

If you have a touch plate, the probe wizard is more accurate and much quicker. Three cycles:

- **Z Touch-off** — the top of the stock.
- **Corner XYZ** — touches two edges and the top to set all three axes on a corner.
- **Tool Length** — a reference reading used to compare tools after a change.

Settings: plate thickness, feed, maximum travel, retract, and tool diameter for corner probing. **Second slow touch** backs off after the first contact and touches again at a crawl — leave it on, it is what makes the reading repeatable. These settings are stored per machine, because two machines rarely share a touch plate.

Before the first cycle, touch the plate to the tool by hand and watch the probe input light up in the status panel. If the controller cannot see continuity, the tool drives into the plate.

Running a job

Pre-flight

Pressing **RUN** opens a checklist. Each item is **OK**, a **Warning**, or **Blocking**. Blocking items stop the job; warnings are yours to judge.

It checks that the machine is connected and answering, that there is no alarm, that the controller is idle, that the machine has been homed if the profile expects it, that work zero has been set, that every cutting layer has a tool the library knows, that the job fits inside the work envelope *where it actually lands*, that laser mode matches the workspace, that safe Z is sensible, that the program holds no commands your controller will refuse, and that no limit switch or probe input is already triggered.

Read it rather than clicking through it. The out-of-bounds check in particular compares where the job lands in machine coordinates, not merely whether it would fit somewhere on the table.

The controls

RUN, **PAUSE** and **STOP** sit at the bottom of the Machine Control panel, with STOP kept clear of the others.

- **PAUSE** holds the machine where it is. **RESUME** continues.
- **STOP** ends the job. The spindle or laser stops and the program is abandoned.

For a real emergency use the machine's physical emergency stop. Software has to ask; a hardware stop does not.

Overrides

While cutting you can change **feed**, **rapid** and **spindle / laser power** overrides, as percentages of the programmed values. Useful when a cut sounds wrong and you want to slow it without abandoning the job. The active percentage is always displayed.

Framing a laser job

FRAME JOB traces where the job will land so you can check the material is in the right place. The arrow beside the button opens its options:

- **Bounding box** or **Outline** of the actual work.
- **One lap** or **keep going round** while you nudge the material.
- **Beam power**, which starts at **zero** — the head travels with the beam off. Raise it only if you need a visible line, and remember that a beam bright enough to see is bright enough to mark. Wear eye protection.

Press **F** to frame with the current settings.

If something goes wrong

An alarm stops everything and shows a banner explaining the code. Common causes are hitting a limit switch, a soft-limit violation, or a probe failure. Clear the cause first, then home the machine — do not simply unlock and carry on, because after an unlock the machine no longer knows where it is.

Tool changes

A job using more than one cutter pauses when the tool changes. The **Tool Change Assistant** appears showing the tool coming out and the one going in — a drawing of the bit, its diameter, type, flute count and your notes — along with the steps the machine is taking.

The spindle stops, the machine lifts clear and travels to the tool-change position if the profile has one.

The job will not continue on its own. Fit the tool, check the collet is tight, then press **Tool Fitted — Resume**. Nothing past the change has been sent to the controller while you were working, so the machine has nothing queued behind the pause.

Tool-length sensor

If the machine has a fixed tool setter, set it up in the machine profile: switch it on, give it its machine coordinates, and set the search distance and probe feed.

The first time, fit a tool you will keep and press **Measure on the setter**, then **Use this as the reference tool**. Every later tool is compared against that reading, and the difference is applied as a length offset when the job resumes.

A measurement that could not be a plausible tool length is refused rather than applied — a probe that triggered on a chip or a loose wire produces a number that looks like any other.

Without a sensor, touch off Z on the work after fitting the new tool.

Machines with a changer

The tool-change strategy is set per machine profile:

- **By hand** — the default. Stop, ask, wait.
- **Macro** — runs your own G-code to unload and load, for a changer the controller already drives.

- **Rack** — tools live in numbered rack positions and the machine fetches them. Give each slot its number, its tool and its machine coordinates.

A tool with no rack slot falls back to asking a person rather than sending the changer somewhere it has never been told about.

The mobile remote

A phone or tablet can watch and control the machine over your local network. The desktop stays in charge; the phone is a second pair of hands.

Pairing

On the desktop, open **Settings** → **Mobile Remote…** and press **Start**. You get a QR code, a six-digit pairing code and one or more addresses.

On the phone, scan the QR — it opens the page and pairs in one step. Or type the address into a browser and enter the six digits.

Both devices must be on the same network, and the phone needs the address shown on screen, not `localhost`.

The screens

Screen	What it offers
Home	State, position and job progress at a glance
Jog	Large arrows, Z, step sizes from 0.01 upward, adjustable feed. **Hold to move** switches to continuous jogging: holding repeats and releasing stops
Probe	A Z touch-off with plate thickness, feed and travel
Job	Thumbnail, filename, operation, tool, progress, elapsed, remaining, position, feed and power, with PAUSE, RESUME and STOP
Macros	Your own macros from the desktop
Log	What the controller is saying, read-only
Status	Work and machine position, feed, spindle, firmware
Settings	Jog feed, keep-screen-awake, connection details, unpair

STOP on the phone needs a deliberate hold — press and keep pressing while the button fills. A tap is far too easy in a pocket.

Permissions

Allow machine control is a master switch in the desktop dialog. Turn it off and paired devices can watch but not move anything. Each device also has its own toggle, so you can revoke one phone without shutting out the rest. **Revoke** forces that device to pair again; **Revoke all** also issues a fresh code. Sessions expire after two hours by default.

The phone can only run macros the desktop has published, by name. It cannot send arbitrary commands, and probing from the phone is limited to Z.

A word about your network

The remote is meant for a workshop network you control. The six-digit code is the only thing standing between a device on that network and a machine that moves.

Do not expose it to the internet. Do not forward the port, and do not run it on a network you do not trust.

Files, history and housekeeping

Projects

Projects save as `.agf` files holding the design, the layers, the operations and the stock. Ctrl+S saves; Ctrl+Shift+S saves a copy.

The app saves a recovery copy periodically and before every job. If it closes unexpectedly, the recovery file is offered when it next opens, and you can recover, inspect or discard it.

Exporting

The **Export** menu offers:

- **G-code (.nc)** — the generated program.
- **Design as SVG** — the geometry, in millimetres.
- **Processed raster (.png)** — for a laser, the actual grid of dots that will be burned, dithered exactly as the layer says. Worth a look before committing a photograph to a piece of walnut.
- **Packaged project (.agfpkg)** — the project together with the tools, material and machine profile it needs, so it opens the same way on another machine.
- **Machine profile (.agfprofile)** — one profile on its own.
- **Tool & material libraries** — shared between machines.

Packages and profiles can be opened by dragging them onto the window. Importing one adds only what is missing; it never overwrites tools you have measured yourself.

Job history

Every run is recorded: what ran, from which project, on which machine, in what material, with which tools, how long it took, how it ended, and how many errors there were. You can add a note — what the material did, what to change next time.

Run Again loads that exact program back onto the machine, without needing the project it came from. It always runs a fresh pre-flight check.

Backup and restore

Export Backup writes your settings, machine profiles, tool library, materials and macros to one file.

Restore Backup… opens a backup, says what is inside it and when it was taken, and restores only what you tick. Profiles and tools can be **added where missing** — leaving everything you already have alone — or **replaced entirely**, which discards your current library. Replacing is a separate, clearly marked choice.

Diagnostics

Help shows versions, operating system, port, firmware, machine state, position, overrides, active inputs, and the controller settings that explain most of what looks like a software fault. **Copy for a bug report** puts it all on the clipboard. Neither the copy nor the exported diagnostic package contains your pairing code or any password.

Controller settings

The GRBL settings manager reads your controller's $ settings, groups them by what they do, and lets you edit, write, back up and restore them. Back them up before changing anything.

Keyboard shortcuts

Keys	Action
Ctrl+N	New project
Ctrl+O	Open project
Ctrl+S	Save
Ctrl+Shift+S	Save As
Ctrl+Z	Undo
Ctrl+Shift+Z or Ctrl+Y	Redo
Esc	Close the dialog, or deselect
F	Frame the job (laser mode)

Shortcuts do not fire while you are typing in a field.

Keyboard jogging

Arrow keys can jog the machine, and Page Up / Page Down move Z — but **only after you switch keyboard jogging on in Settings**. It is off by default, deliberately: a stray arrow key should not move a machine.

With it on, holding a key jogs continuously and releasing stops. Losing window focus stops it too, so an alt-tab with a key held does not leave the machine moving.

Troubleshooting

The machine will not connect. Check the port and that nothing else has it open — two programs cannot share a serial port. Check the baud rate, usually 115200.

It connects but sits in Alarm. Normal on a machine with homing enabled. Home it. If it alarms again immediately, a limit switch is probably already pressed; jog clear first.

Pre-flight says the job is outside the work area. It compares where the job lands in *machine* coordinates, not just its size. Either the work origin is somewhere unexpected or the job really is off the table. Check the origin first.

Nothing happens when I press Generate. Every layer needs an operation, and every cutting layer needs a tool. Layers with the output square off are skipped.

The cut is in the wrong place. Almost always the job origin or the work zero. Check that the origin grid matches the corner you touched off on, and that the crosshair on the canvas is where you expect relative to the stock.

The cut is the right shape but the wrong depth. Check the **Z zero** setting — material top versus bed — and that the stock thickness is right.

The part is a fraction too big or too small. Check the cutter diameter in the tool library against the actual cutter. A profile is offset by exactly half of that number.

A laser photograph came out muddy. Export the **processed raster** and look at what will actually be burned. Adjust the dither mode, the line interval, and the image's own contrast before blaming the power setting.

The probe drove into the plate. The controller could not see continuity. Before every first cycle, touch the plate to the tool by hand and watch the probe input in the status panel.

A relief came out terraced. Heights are stored in 256 steps over the model's depth. On a deep model each step is visible. Scale the relief shallower, or split it.

The values are in the wrong units. The units setting switches every length field between millimetres and inches, and converts what is already there. Check it in Settings.

The phone cannot find the machine. Both devices must be on the same network. Use the address shown in the Mobile Remote dialog, not `localhost`. A guest network usually blocks devices from seeing each other.

Safety

These are not suggestions.

Stay with the machine. Both a router and a laser can destroy a workpiece, break a cutter or start a fire in the time it takes to make a cup of tea. The remote lets you watch from the next room; it does not let you leave the building.

Know where your emergency stop is and use it first. The STOP button asks the controller to halt. A hardware emergency stop cuts the power. When something is going wrong, reach for the hardware.

Never open the enclosure or look at the beam while a laser is running. Wear eye protection rated for your laser's wavelength. This includes framing with the beam on.

Do not cut material you have not checked. PVC and many plastics release chlorine gas in a laser, which will damage your lungs and your machine. Check what a material does before it goes under the beam.

A laser needs extraction and something to put a fire out with. Keep both to hand.

Clamp the work properly. Use tabs on any part that would otherwise come loose mid-cut. A part thrown by a spinning cutter travels a long way.

Check the first cut of every new job. Watch the first pass from a safe distance with your hand near the stop. The cheapest time to find a mistake is in the first ten seconds.

Simulate before you cut. It costs nothing and catches most of the mistakes that cost something.

Treat the pre-flight warnings as information, not obstacles. They exist because each one has, at some point, been the thing that ruined somebody's afternoon.