

FrameForge

FrameForge PRO

Parametric aluminium enclosure designer for CNC and laser

User Guide

From a single-panel sketch to a ready set of STEP files for the factory

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1. What is FrameForge PRO

FrameForge PRO is a tool for designing aluminium enclosures (for amplifiers and other electronics, for example) that are later cut on a CNC mill or laser cutter. Instead of manually drafting each of the box's six panels one by one, the program can build the whole box at once from a handful of numbers — width, height, depth, and fastener type — and you then fine-tune each panel by hand: adding holes for connectors, ventilation, engraving, and so on.

The output is not just a picture but a set of files ready for real production: drawings for laser cutting (DXF), scripts for 3D modelling in Fusion 360, and a ready set of STEP files (one per panel and per cube type) that open in any CAD program without Fusion.

HOW THIS WORKS

The program doesn't estimate anything “by eye” — dimensions and cube counts are taken from what is actually drawn on the panels. Only holes whose diameter matches the chosen fastener (M3/M4/M5) count as bolts — a hole for an RCA jack or a potentiometer will not be counted, even if it's present on the panel.

2. Three ways to start a project

The start screen offers three modes — they are not different programs, but different levels of depth. You can start in one mode and switch to a more detailed one later.

Quick Start

Enter three numbers — the box's internal width, height and depth — and pick a fastener (M3, M4 or M5). Everything else (wall thicknesses, gaps, cube-hole placement) the program sets by sensible defaults. The fastest path for a typical enclosure.

Step-by-step Wizard

The same thing, but step by step, with an explanation of every parameter. A sensible choice if you're using the program for the first time and want to understand what each field does.

PRO mode

Direct access to every parameter at once — the thickness of each of the six walls individually, gaps, hole-finish type per panel, partitions. For those who already know the interface and want to fine-tune a box for a non-standard task.

Once the box has been generated (the “Generate 6 Panels” button), you can switch to “Panel-by-panel assembly” mode and fine-tune each of the six sides separately — adding holes for specific connectors, ventilation, or engraved text.

3. Workspace: panels, sides, tools

The box has six sides: Front, Rear, Left, Right, Top, Bottom. Switch between them with the “Side” dropdown in the top panel — the canvas redraws itself for that specific panel.

Tools in the left panel

Tool	What it's for
Hole	A round hole — for a screw, connector, or LED. Size and coordinates can be entered precisely as numbers, not only dragged with the mouse.
Window	A rectangular cutout — for a display, button, or control panel.
Vent	A row of identical rectangular slots, evenly spaced — a ventilation grille.
Text	Engraved lettering — converted to outlines on export, behaves like an ordinary vector shape and doesn't depend on whether the required font is installed on the machine.
Clamp	An elongated element with several holes along its length — for extended-run fastening.
Cube	Manually adding a fastener cube — for non-standard cases; cubes are normally placed automatically when the box is generated.

Editing an element

- Drag from the centre — move it.
- Drag from the edge — resize it (for windows, vents, clamps).
- Select and press DEL — delete it, or simply drag the element off the edge of the grey canvas.
- Arrow keys (← ↑ → ↓) — fine adjustment of 0.1 mm per press; with Shift held — 1 mm, for larger corrections.
- Hold Shift and click several elements — they group together (a badge appears) and move as one.

Mid-span supports

The box-parameters panel (Quick Start / Wizard / PRO) has a block of six checkboxes — one per side of the box, arranged the same way the box itself unfolds (lid on top, bottom below, front/rear/sides around). If a panel is large enough, the program adds an extra support cube in the middle of it — not just at the corners — so a long wall doesn't flex. A cube only appears where it actually rests on something from two sides (for example, a mid-span cube on the bottom only appears if the front and/or rear also take part in the support).

HOW TO USE THIS

Uncheck a specific side and its mid-span cubes disappear the next time the box is generated. Useful if something of your own will sit on that side instead (a ready-made heatsink instead of a wall, say) and the extra cube gets in the way.

Partitions

The “Add Partition” button places an extra wall inside the box, with its own fastener cubes — splitting the box's volume into compartments, for example to shield the power supply separately from the audio path.

Type	What it does
Transverse	Splits the box into a front/rear compartment. Position is set as a distance from the front, going deeper into the box.
Longitudinal	Splits the box into a left/right compartment. Position is set as a distance from the left wall, going right.

The program never lets you place either partition flush against the edge when adding it — a minimum clearance from the wall is kept automatically, so the partition's fastener cube doesn't collide with a corner cube of the box. A partition's fasteners are the same cubes used at the box's corners, and are added/removed like any other element.

Saving and change history

The “SAVE” button writes the current panel to the database under a PIN + project ID pair. Next to “LOAD” is a button with a clock icon: a short list of recent saves for the project — what actually changed (by count of holes, windows, cubes) and when. Useful if you come back to a project after a few days and don't remember what you last edited.

4. Fasteners: hole types and cubes

The box is held together by corner and support aluminium cubes — each threaded on three sides for the chosen fastener (M3, M4 or M5), with screws passing through holes in the panels to pull the whole assembly together.

Fastener hole finish — chosen per panel

Type	Description
Plain	A simple through-hole with clearance for the screw. Works with any screw head (countersunk, cylindrical, socket-head), but the head will protrude above the surface.
Countersink	A 90° conical chamfer above the hole — for a flat/countersunk screw head (DIN 965 / ISO 2009). The head sits flush with the surface, a cleaner look.
Counterbore (socket head)	A cylindrical recess for a socket-head screw (DIN 912). Requires a thicker panel than a countersink — the program warns you automatically if the thickness isn't enough.

A laser physically cannot cut a countersink or counterbore

Those are drilling/milling operations. When exporting to DXF (laser cutting), the program draws them not as a real cut but as a marking circle on a separate MARKING layer — so it's visible where to drill afterwards, by hand or on another machine. Make sure whoever cuts the blank from the laser DXF knows about this.

Material weight and cost

Next to the fastener selector is an optional “Price per kg” field. The program computes the box's weight itself (each panel's area minus all cutouts, multiplied by thickness and by aluminium's density — 2.7 g/cm³, a standard value for common alloys) and shows it in the summary line at all times. If you fill in your own price per kilogram, an estimated material cost appears next to it. The program never makes up a price itself — the field stays empty until you fill it in.

5. Connector cutout library

The tool panel has a ready-made list of standard connectors — pick the one you need from the dropdown under the tool buttons and press the add button. A correctly sized cutout is added to the panel; all that's left is to drag it into place.

Connector	Cutout
IEC C14 power inlet	Rectangular cutout 20 × 27.5 mm
XLR (D-series, round)	Round hole Ø24 mm — the most common format, even third-party manufacturers match this size
6.35mm jack (round)	Ø9.5 mm — for the most common DIY round threaded-bushing body
RCA / phono	Ø10 mm
Mini toggle switch	Ø7 mm
Potentiometer (9mm shaft)	Ø7 mm — for M7 thread

Check against the real part before cutting a whole batch

These dimensions come from several independent sources (manufacturer specs, proven installation experience), but a specific part you've bought — especially a cheap one from an unverified supplier — may differ from another manufacturer's by a fraction of a millimetre. Hold the real connector up to the first test cutout and check it by eye before cutting a whole batch of panels.

6. Reference point: transferring dimensions from a real PCB

A common task is fitting a ready-made PCB (an amplifier board, a controller, etc.) into the box and drilling holes for it exactly in place. The problem is that with calipers in hand you measure distances from the corner of the BOARD, while coordinates on the panel are counted from the corner of the PANEL — doing that conversion in your head is almost guaranteed to cause a mistake.

The “Reference point” button solves this directly. The logic is three steps:

- Add a reference point and drag it to where the board's corner will physically sit inside the box (with whatever clearance from the wall you choose). On the panel it shows as a yellow crosshair labelled “0,0” — the point itself never goes into a cutout, it is purely a reference marker.
- Every added hole/cutout, besides the usual X/Y, gets extra “ ΔX / ΔY ” fields — enter here exactly the number measured with calipers from the board's corner to the hole you need. The program converts it to panel coordinates itself.
- Only one reference point is allowed on a panel at a time — this rules out any confusion about which point distances are measured from.

HOW THIS WORKS

This is not a separate mode or a new file — the same holes, the same saving and export as always. The reference point is just a convenient way to enter numbers; the real coordinates on the panel are still counted as usual.

The “Corner / Point” toggle

Besides the $\Delta X/\Delta Y$ fields in the properties panel, there are two more places where you can see coordinates live, right while dragging with the mouse — under the engineering loupe, and a small panel under the canvas itself. Both have a “Corner” / “Point” toggle — this is ONE shared setting, not two separate ones: switch it in one place and the other switches too.

- “Corner” mode — coordinates are counted as usual, from the panel's corner.
- “Point” mode — coordinates are recalculated from the reference point. The numbers and the button itself turn the same amber colour as the point on the canvas — so it's always clear what the distance is currently being measured from.
- If there's no reference point on the panel, both buttons are disabled. If the point is deleted while “Point” mode is on, the program switches back to “Corner” mode on its own.

The loupe and precise placement

The engineering loupe (the magnifying-glass button on the canvas) zooms in on the area under the crosshair and lets you drill a hole with a click right inside the enlarged view — handy for small parts where it's easy to miss by a tenth of a millimetre at normal zoom.

TIP

When the mouse cursor lands EXACTLY on the loupe's crosshair centre, the crosshair itself turns bright red with a glow — confirming that a click right now will land exactly on the tracked point, not a hair's breadth off.

7. Keyboard shortcuts

Keys	What they do
← ↑ → ↓	Move the selected element by 0.1 mm
Shift + arrow	Move by 1 mm (for larger corrections)
Esc	Deselect
DEL	Delete the selected element
Ctrl+Z	Undo the last action
Ctrl+Shift+Z (or Ctrl+Y)	Redo the undone action
Shift + click elements	Group several elements to move them together

8. 3D preview and fastener match check

The “3D VIEW” button in the top panel opens a 3D model of the whole assembly — the box is built up from all six panels before your eyes, with labelled sides. Mouse: left button — rotate, right button — pan, wheel — zoom.

The program automatically checks that every fastener hole on a panel actually lines up with the hole in the corresponding cube — exactly the kind of thing you can't verify by eye on a flat drawing, and without this check it's easy to end up with mismatched panels only once they're already in metal.

- **Green cube** — holes line up, all good.
- **Red/orange cube** — there's a mismatch, recheck the panel before sending it off for cutting.

RULE

Open the 3D preview before EVERY export for production, even if it seems like nothing changed — especially after dragging a cube with the mouse or undoing an action (Ctrl+Z). The “Check before export” window will remind you if the check hasn't run at all in this session.

The “Ready for production” screen

The top-left corner of the 3D preview now shows one combined checklist instead of separate messages — bolt matches, cube-to-cube collisions, edge clearances, and overlapping holes are all visible at once. A green border means everything's fine; a red one means at least one item needs attention before sending the file to the factory. On the right, a separate badge shows the bolt and cube counts — always visible, no need to open the export window just to check.

If a panel has a countersink or counterbore selected, a small amber marker (a cone or washer shape) appears on the matching holes in 3D, with a note in the corner of the screen explaining it's a visual marker, not a real cut.

9. Export: which format for what

The “EXPORT” button opens a window with all the available export formats. Before the download itself, a summary is always shown — how many panels, how many bolts and cubes you'll get — so you can check beforehand, not after.

Button	What you get
Export: 1 panel	A Python script for Fusion 360 — builds only the panel currently open on the canvas.
Export: 6 panels	A Python script for Fusion 360 — builds all six panels of the box at once, with automatic countersink/counterbore marking and a README with a fastener shopping list.
STEP without Fusion (per part)	A separate .step file for each panel, each clamp, and each unique corner/support cube type (identical cubes -- one file plus a quantity, never duplicated per piece) -- built directly on the server, no Fusion 360 needed. The ZIP has panels/, clamps/ and cubes/ folders, a manifest.json listing everything, and a PNG preview next to every file for a quick visual check.
Laser: outline	A DXF drawing of the panel for contour cutting.
Laser: fill	A DXF with real hatching of the ventilation slots (not just a duplicated outline).
Laser: marking	A DXF for surface engraving (lettering, marking for drilling out countersinks/counterbores afterwards).
Fastener cubes (Fusion)	A Python script for Fusion 360 — the same set of cubes, but as Fusion Python code rather than a ready file. If you just need a ready .step for the cubes, it's already in the STEP button above -- use this one only if you specifically want to build the cubes inside Fusion itself.
Project specification	A printable/copyable document: dimensions, thicknesses, fasteners, bolt and cube counts — see section 10.

STEP without Fusion — now one part per file

Each file is a separate order line -- pick material, quantity and finish per file, exactly as with any other CNC/laser quote. Holes are built by genuine solid-body subtraction (a slab minus a cylinder/cone), so arcs stay mathematically exact.

Countersink/counterbore orientation was verified mathematically across all six sides of the box at once through real FreeCAD -- confirmed by a number, not a visual guess. Before sending a real batch to the factory, it's still worth opening the file once in a CAD program and checking by eye -- the PNG preview in the ZIP is a helpful hint, not a substitute for that check.

TWO TIPS FROM REAL FACTORY ORDERS

Be sure to ask the manufacturer to group and clearly label the cubes on delivery -- without labels, matching the right cube to the right corner by eye becomes a tedious, error-prone chore. And don't overpay for enclosure wall material without a specific reason -- an inexpensive, easy-to-machine alloy is usually the right choice; a pricier one rarely improves anything for a typical build.

10. Project specification and shopping list

The “Project specification” button opens a separate document with a full summary of the current project: internal dimensions, the thickness of each wall, fastener type and count, a breakdown of bolts by hole finish (plain / countersink / counterbore — they need different screw heads), cube count, and the 3D check status.

Every number is computed from what is actually drawn on the panels — never a rough “by eye” guess. Only holes matching the chosen fastener's diameter (M3/M4/M5) count as bolts; arbitrary holes for connectors, potentiometers, and so on are not included, no matter how many are on the panel. This is the exact list you can take with you on one trip to buy fasteners, instead of having to go back if something runs short.

- Print — opens the document in a separate window, ready to print on paper.
- Copy — copies a text version of the document to the clipboard, to paste into a note or send to a fastener supplier.

11. Interface languages

The interface is translated into four languages — Russian (RU), English (EN), Czech (CS) and German (DE). Switch between them with the buttons in the top-right corner of the program's header, at any time, without losing any data you've entered.

12. Common mistakes and what to watch out for

- Dimensions in Quick Start and the Wizard are always internal, not the box's outer dimensions. The outer size will be larger by twice the wall thickness.
- When resizing a panel by dragging its edge with the mouse, you cannot drag the edge in past whatever elements (cubes, holes) are already placed on it — this is a safeguard against an element accidentally ending up outside the panel.
- After dragging a cube with the mouse and undoing (Ctrl+Z) — as noted in section 8, always open the 3D view and check that holes still line up before saving or exporting.
- Before saving all panels or exporting — if you've edited several panels in a row, give the program a second for autosave (it fires every 30 seconds), or save manually with the “SAVE” button, before closing the tab.
- Countersink/counterbore on a laser DXF — this is only a marking, not a real cut (see the warning in section 4). The machine does the actual countersink/counterbore as a separate drilling operation.
- The edge-clearance warning — if an orange note about an element near a panel's edge appears under the summary line (“Bolts: ... Cubes: ...”), take it seriously: a wall that's too thin at the edge is a common cause of chipping on the machine or of the factory rejecting the part. This checks not just the automatic fastener holes but anything you've added by hand.
- The “CLEAR” button reports the truth: if there was nothing to clear, it says so plainly, without asking for confirmation; if something was deleted, it confirms exactly what.

This document describes the program's main features as of the time it was written. If something in the interface looks different, or a new button has appeared — that's normal, the program keeps being improved.