

GUIDE · version a69 · October 2026

FrameForge PRO

User guide and production reference: aluminium enclosures for CNC and laser

- From three dimensions to factory-ready files
- Panels, partitions, threaded fastener cubes, transistor clamp bars
- Export: STEP without Fusion, DXF for laser, Fusion 360 scripts
- Fastener shopping list and 3D check before ordering
- Interface in 4 languages: Czech, English, German, Russian

autoservis.shop · FrameForge PRO · Andrei Pasunko (mechanic) and AI assistants

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1 What it is

FrameForge PRO is a browser-based tool for designing **aluminium enclosures** (amplifiers, power supplies, instruments) that are cut on a CNC mill or laser. You enter the inner width, height and depth and the fastener size (M3/M4/M5); it builds six panels with corner and support cubes. You then add holes, windows, ventilation, text, clamp bars and partitions. The output is a set of files ready for the factory.

Who it is for: makers and electronics hobbyists who want a finished enclosure without months of learning CAD. No programming needed.

2 Three ways to start

Mode	Purpose
Quick start	Inner width/height/depth and M3/M4/M5. Everything else is default.
Step-by-step wizard	Same inputs, with explanations at each step.
PRO MODE	Per-wall thickness, gaps, hole finish type, partitions.

Once the box is built, “Edit by panels” lets you pick a side (FRONT, REAR, LEFT, RIGHT, TOP, BOTTOM) and edit that panel.

3 Panels and tools

Tool	What it does
Hole	Round hole; X/Y and diameter can be typed.
Window	Rectangular cutout.
Vent	A row of identical slots at an even pitch.
Text	Engraving, converted to outlines on export.
Clamp bar	Transistor hold-down with holes along it.
Cube	Manually placed fastener cube for special cases.

- Centre of an element moves it, an edge resizes it.
- Arrows — 0.1 mm step; Shift+arrow — 1 mm; Del — delete; Esc — deselect.
- Shift+click several elements to group them (padlock) and move together.

- **Loupe** — placement precise to hundredths of a millimetre.

4 Fastener cubes and threads

Panels are joined by cubes. Cube size is picked automatically from panel thickness and fastener (standard series 1.0 / 1.2 / 1.5 / 2.0 / 2.5 / 3.0 cm).

- **Threads are cut only in the cubes**, never in the panels. Tap-drill diameters: M3 — Ø2.5 mm, M4 — Ø3.3, M5 — Ø4.2.
- Physically there are only **4 kinds of cubes** (two corner cubes A and B, two supports X and Z), so the factory sets up the machine 4 times.
- Channels inside a cube never intersect; the web between them is at least 1.1 mm (M3).
- Panel holes come in three finishes: plain, countersink (flat head) and counterbore (socket head). For laser DXF, countersink and counterbore are marked, not cut.

The Fusion cube script spaces the cubes apart, otherwise drilling one cube would pierce its neighbour.

5 Partitions

A partition is a separate part, not a seventh side. It can be **transverse** (splits the box into front and rear compartments) or **longitudinal** (left and right). Its cubes stand right next to the plate, not inside it.

- If it does not fit where placed, it is moved to the nearest allowed position with a message “moved from X to Y mm”.
- A transverse and a longitudinal partition that cross give a red warning: one must be cut in two.
- Old-format projects: open and press “Generate panels”.

6 Clamp bar — thickness calculation

A clamp bar presses transistor cases against a heat-sink panel. Under the “Thickness” field the program tells you whether the bar is stiff enough: aluminium ($E = 69\,000\text{ N/mm}^2$), 100 N per transistor, deflection limit 0.05 mm; it checks the span between screws and the overhang past the end screw.

- A thin bar gives a yellow line in the 3D check with a recommended thickness.
- A transistor beyond the end screw is pressed much weaker: moving the screw toward the bar end often beats a thicker bar.
- The panel under a bar is always drilled by the bar’s holes.

7 Fastener shopping list

The “Fasteners: what to buy” button builds a table of screws, nuts and washers (A2 stainless) from the geometry you drew. A STEP export puts the same list in the archive as `FASTENERS_KREPEZH.txt`.

- Screw length into a cube = panel thickness + 2×d thread engagement, rounded up to a standard length (M3: 4, 5, 6, 8, 10, 12, 14, 16, 18, 20, 25, 30 mm).
- Head by hole finish: countersink — DIN 7991/ISO 10642, counterbore — DIN 912, plain — ISO 7380.
- Spare +10 %, at least 2 per line. Print and Copy buttons included.

8 Reference point and connector library

If hole positions were measured with calipers from the corner of a real PCB, place a “Reference point” (yellow 0,0 marker): you type $\Delta X/\Delta Y$ and the program converts to panel coordinates. A Corner / Point switch chooses the origin.

Connector	Cutout / hole
IEC C14	20 × 27.5 mm
XLR D-series	Ø24 mm
6.35 mm jack	Ø9.5 mm
RCA / phono	Ø10 mm
Mini toggle	Ø7 mm
Potentiometer, 9 mm shaft	Ø7 mm

Library sizes are approximate: check the first test cut against the real part before a production run.

9 3D check before production

“3D VIEW” assembles the box and checks that every bolt hits its cube, cubes do not collide, holes do not overlap and edge webs are not too thin. The check works on volumes. The result is a “READY FOR PRODUCTION” badge or a list of reasons.

Colour	Meaning	Action
green	Check passed.	Continue.
yellow	Geometry valid but margin is small.	Look and decide.
red	Real conflict.	Stop and fix.

Open the 3D check before every export, especially after moving a cube.

10 Export: which format for what

Export	Purpose
STEP without Fusion	Part files built server-side with true solid booleans (exact circles, not polylines).
Fusion: 1 or 6 panels	Python script for Fusion 360.
Cubes (Fusion)	Cube script; each cube is a separate body.
Laser: outline / fill / marking	DXF for cutting, vent hatching and marking for later drilling.
Project specification	Dimensions, thicknesses, fasteners, cubes, 3D check result.

Before download, the export window shows a summary of panels, bolts and cubes — one more checkpoint.

11 Saving, PIN and projects

- **PIN** is the PROJECT code (protection against overwriting), not the login password. An empty PIN means autosave is off, and the program says so.
- On a version conflict the program never silently overwrites; it asks for confirmation.
- After an important edit, save, reload if needed and Load before exporting.

12 Checklist before ordering

- The right project and version are open.
- All panels checked, partitions included.
- 3D check: no reds, yellows understood.
- Summary (panels, bolts, cubes) matches expectations.
- Right DXF type for the laser; “marking” is not a cut.
- Fastener list downloaded and parts bought with a spare.
- Tell the factory: “tap threads through in the cubes, no threads in the panels”.
- For a first order, one small test enclosure.

13 If something looks odd

What you see	What it means
Yellow warning	Usually not a failure, just a small margin. Check before ordering.
Red error	Do not treat the result as ready until fixed.
Version conflict	A newer edit exists; do not overwrite until you know which to keep.
Red line about a manual cube	Select the cube and press “Align holes”.
Old-format partition	Press “Generate panels”.

Who built it. Andrei Pasunko (mechanic and electronics repairer, Czechia) — idea, architecture, real manufacturing dimensions and tolerances, factory testing. Code and logic together with the AI assistants Claude (Anthropic), Gemini and DeepSeek. No third-party code was copied in.

FrameForge PRO, aluminium enclosure, amplifier chassis, CNC, laser cutting, DXF, STEP, Fusion 360, fastener cubes, parametric CAD, enclosure designer, autoservis.shop