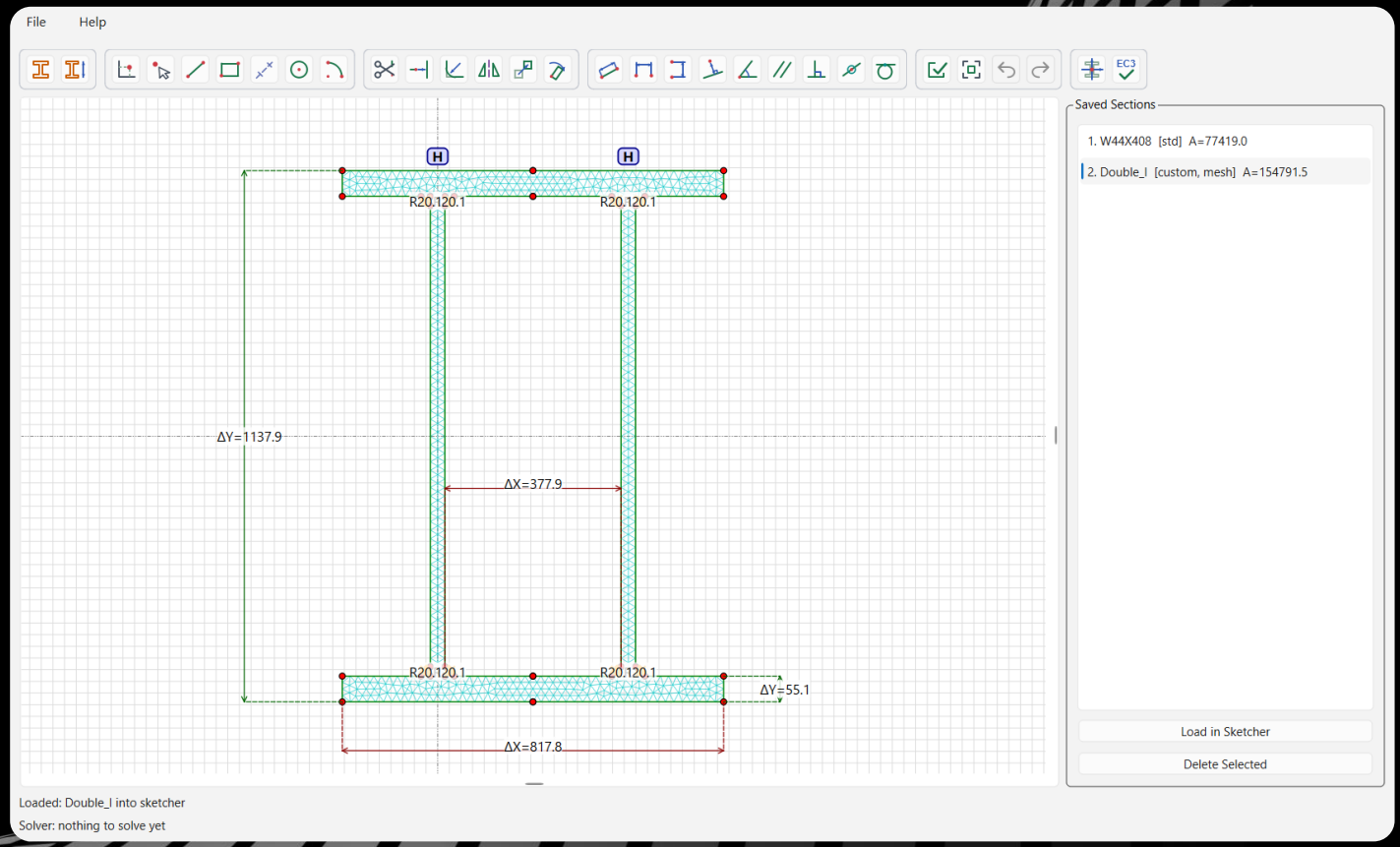
STEEL SECTIONS

RGSHAPE

Sketch, properties and Eurocode 3 checking of steel sections

Overview of the application



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Draw a section, get its properties, check it

RGSHAPE is a desktop application for steel cross-sections: pick or draw the section, compute its properties on a finite-element mesh and check it to Eurocode 3, in one window.

Any section, three ways in

From the AISC catalogue, from its dimensions, or drawn in the sketcher.

Properties you can rely on

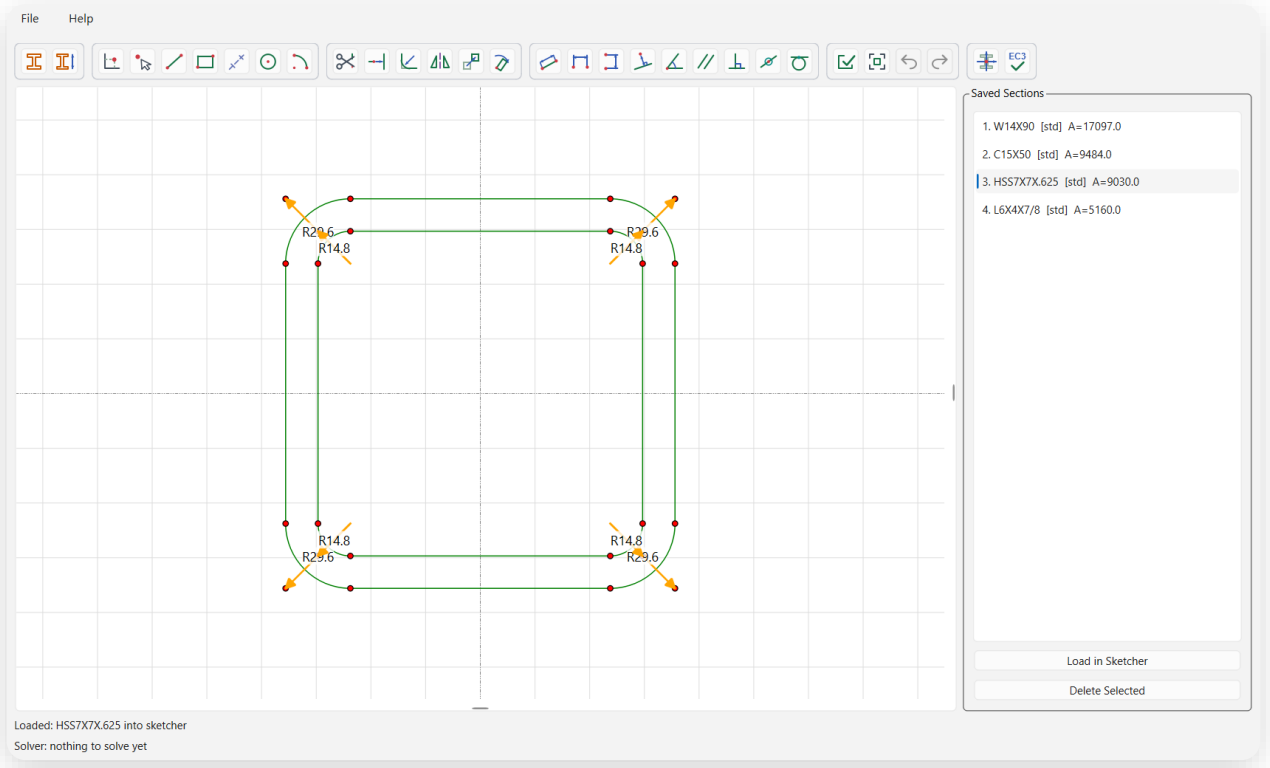
Area, inertias, plastic moduli, torsion and warping constants from a finite-element mesh: the torsion constant within 0.3 % of the converged solution on 57 catalogue profiles.

Checked to Eurocode 3

Classification, resistance and stability checks of EN 1993-1-1 under your loads, each clause printed with its formula and its numbers.

Your sections, kept

One .gshape file holds the sections, their sketches and their meshes.



A rectangular hollow section of the AISC catalogue in the sketcher, with its corner radii

WORKFLOW

From a sketch to a checked section

One window, five steps, each feeding the next: the section, its sketch, its properties, its check, its file.

01 Section

AISC catalogue
Typical sections
Free sketch

02 Sketch

Lines, arcs, circles
Constraints
Profile check

03 Properties

Mesh of the section
A, I, W, J, Cw
Shear centre

04 EC3 check

Section class
Resistance
Buckling, LTB

05 File

Sections kept
Sketch and mesh
One .gshape file

Units: section geometry and properties in mm; in the check, forces in N and moments in N·mm. Every change of the sketch can be undone.

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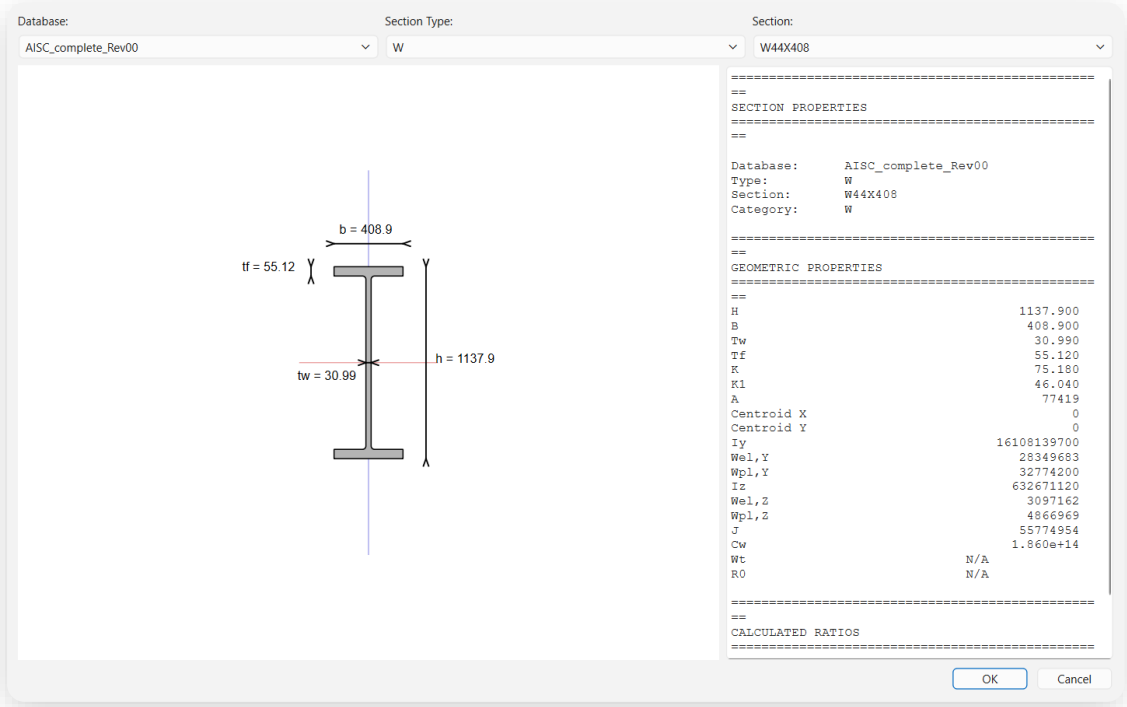
From the catalogue or from its dimensions

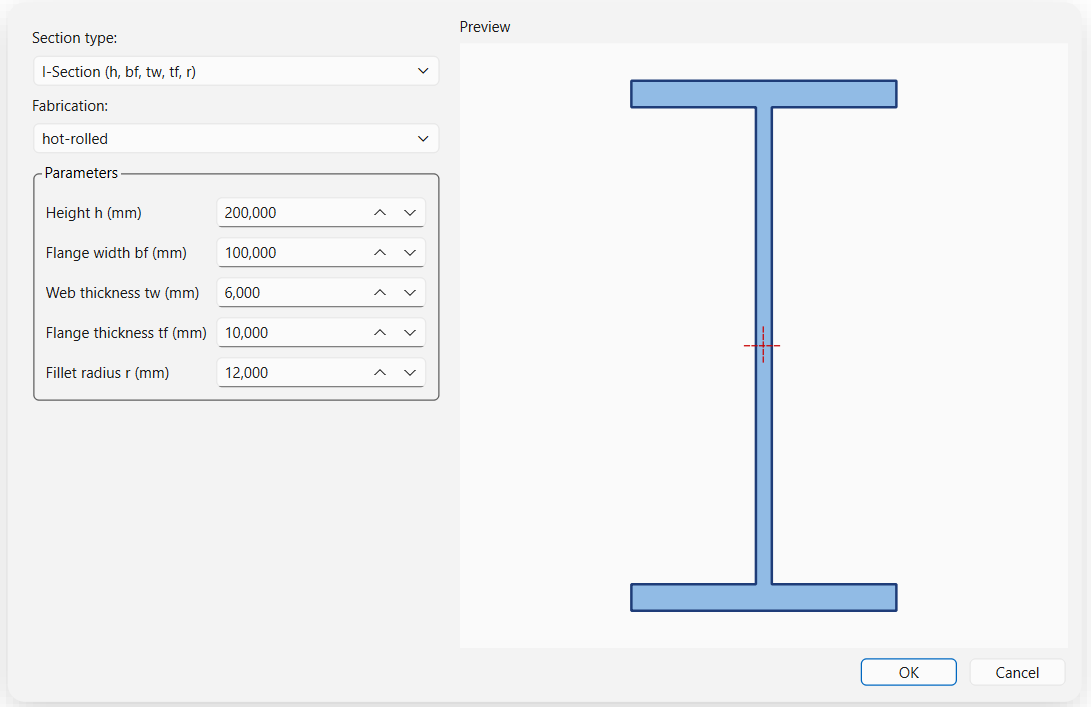
Standard section



W44X408 of the AISC catalogue, with the properties of the table

- **Standard section:** the AISC shapes (W, S, M, HP, C, MC, L, WT, HSS, pipes), drawn with their root radii and saved with their tabulated properties.

Typical section



An I-section by its dimensions, with its fabrication

- **Typical section:** I, H, monosymmetric I, T, channel, angle, RHS, CHS and solid bars by their dimensions; properties computed on the mesh.

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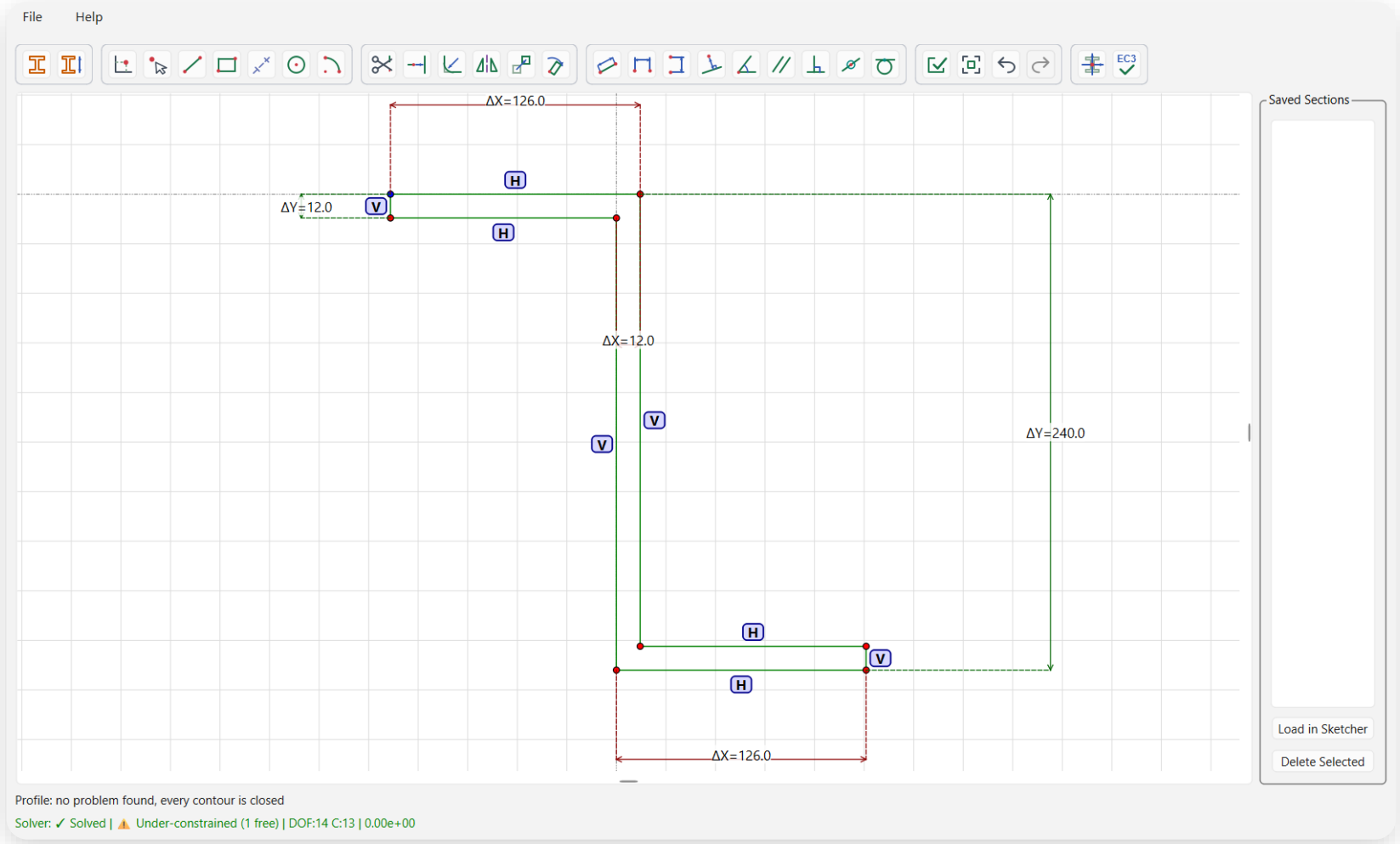
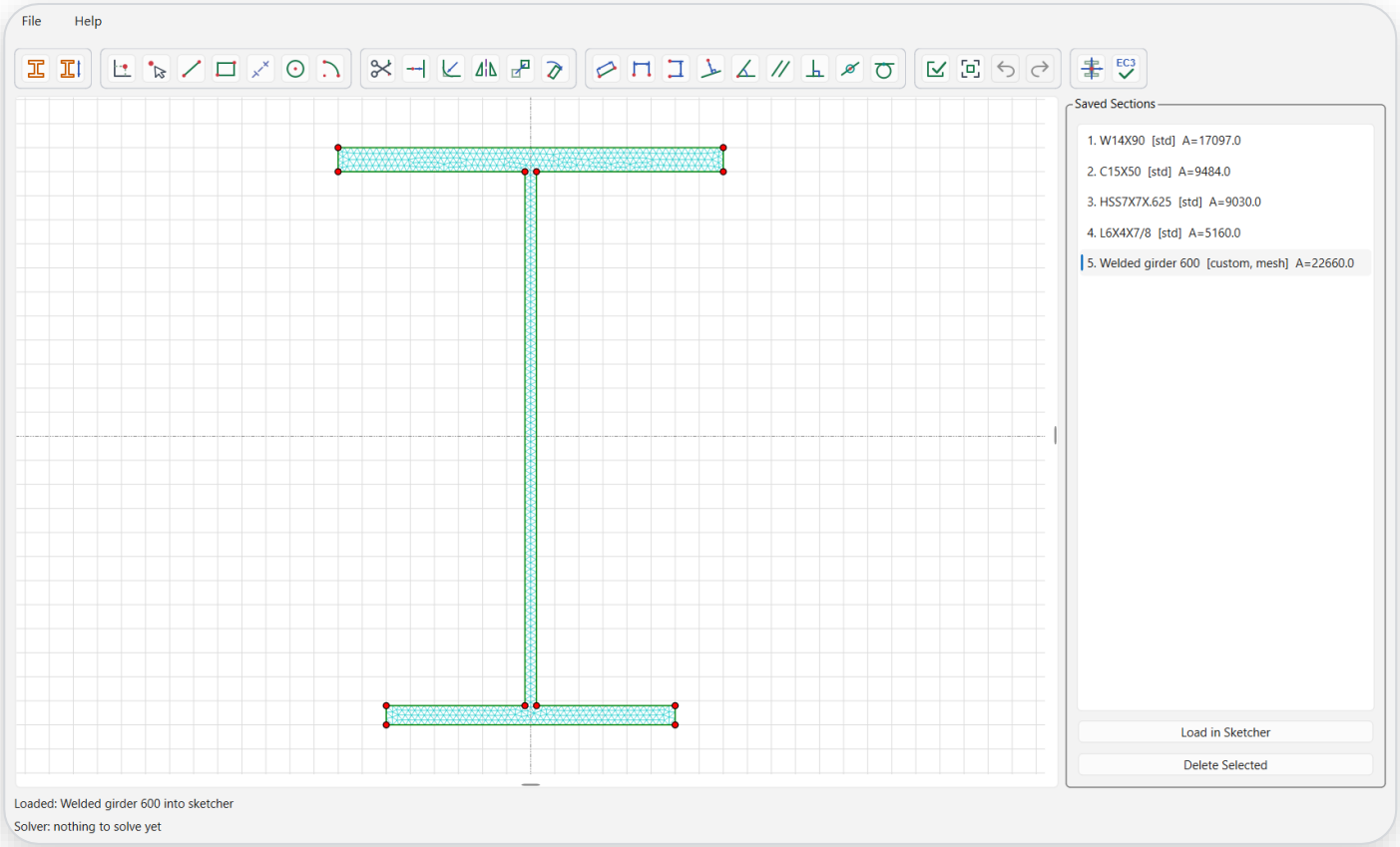
Or draw it: the sketcher

- **Draw:** points, lines, rectangles, circles, arcs and fillets, with construction lines to build on.
- **Constrain:** distances, angles, parallel, perpendicular, coincident, tangent, symmetry. The solver runs after every change.
- **Modify:** trim, extend, translate, rotate, copy by symmetry; undo and redo.
- **Check profile:** an open contour or lines that cross are marked in red before meshing.



A Z-section drawn with its dimensions: the solver holds the constraints, the profile check finds no problem

Properties on a finite-element mesh



A welded girder 600 mm deep, meshed: it is listed with its mesh among the saved sections

- **Compute properties:** the section is meshed and solved for its area, centroid, inertias, elastic and plastic moduli, torsion and warping constants and shear centre.
- **Torsion on quadratic elements:** J within 0.3 % of the converged solution on 57 catalogue profiles, in a fraction of a second.

```
Welded girder 600                          computed
-------------------------------------------------
Mesh              1 243 triangles, size 6.67 mm
Area  A                    22 660         mm2
Centroid  y                  49.35        mm
Inertia  Iy                1.4477e+09     mm4
Inertia  Iz                1.7841e+08     mm4
Plastic modulus  Wpl,y     5.2157e+06     mm3
Torsion constant  J        3.1197e+06     mm4
-------------------------------------------------
J by two integrals: relative difference 3e-16
```

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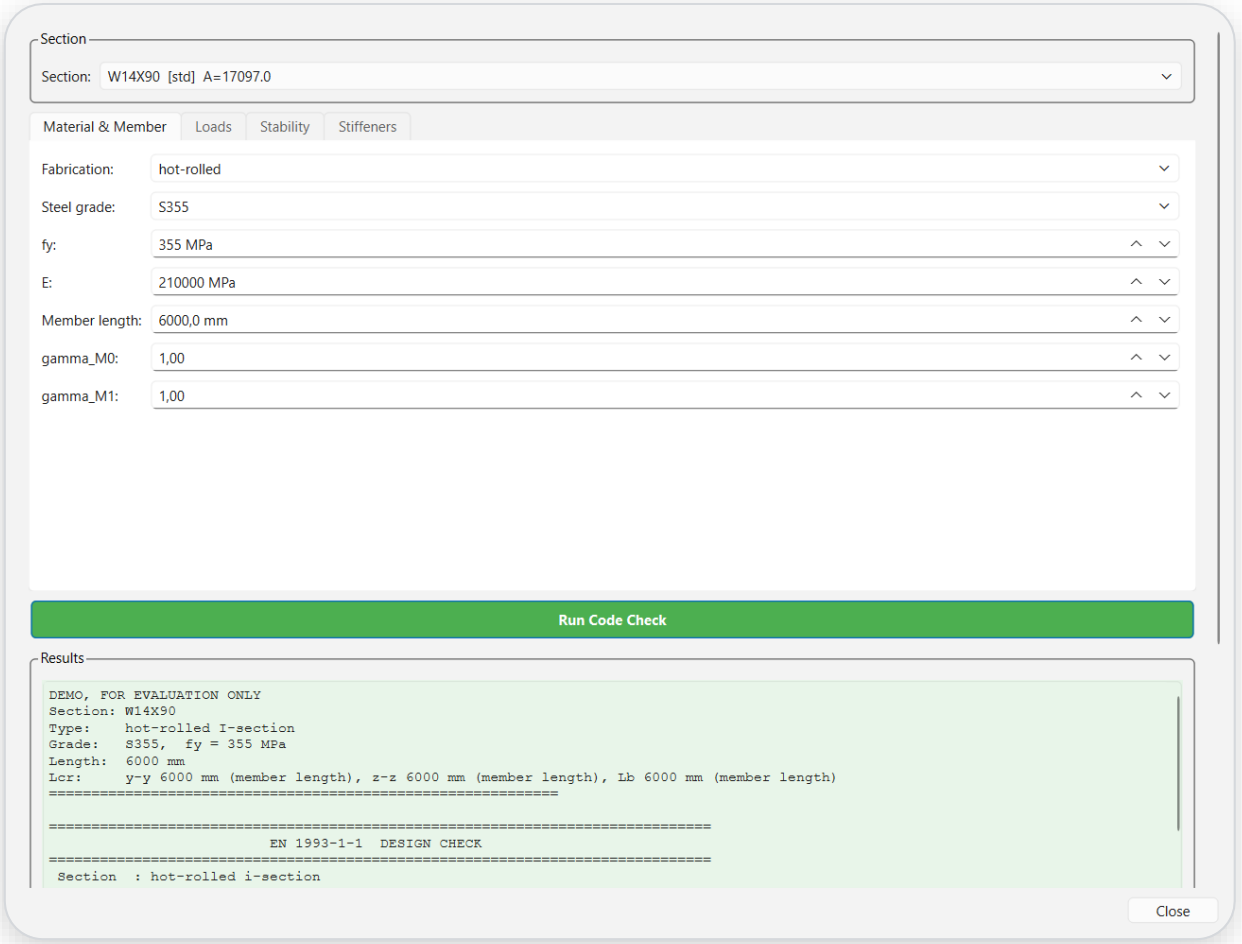
Eurocode 3 check of the section



W14X90, S355, L = 6 m under N, Vz, My and Mz: every clause with its formula and its numbers

- **Inputs:** steel grade, member length, the six force components, the buckling lengths and the LTB factors C1, C2, kz, kw, zg.
- **Checks:** classification, resistance, flexural and lateral-torsional buckling, shear and the N + M interaction of EN 1993-1-1.

Clause	Check	Util	Verdict
§6.3.1	Axial buckling	0.103	OK
§6.2.5	Bending y	0.216	OK
§6.2.5	Bending z	0.041	OK
§6.3.2	LTB	0.245	OK
§6.2.6	Shear z (web)	0.128	OK
§6.2.9 / 6.2.10	CS linear	0.324	OK
§6.3.3	Eq 6.61	0.369	OK
§6.3.3	Eq 6.62	0.391	OK <- governs

ALL CHECKS PASS Max utilization = 0.391

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Your sections, kept in one file

A .gshape file holds everything of a session as readable text with a version number, and opens on a double click.

Sections, sketches and meshes

Each saved section keeps its sketch, its properties and its mesh.

Back in the sketcher

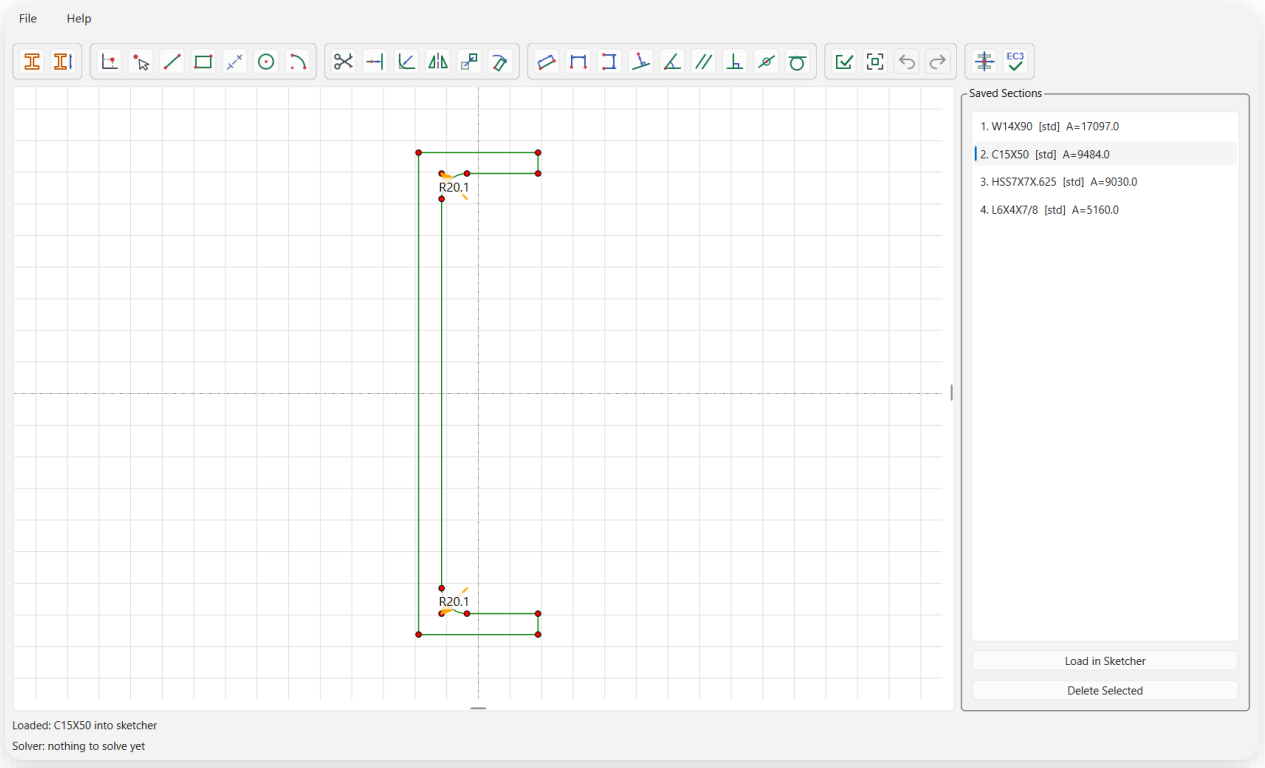
Load a saved section to edit it: its mesh is drawn again. A right-click clears the mesh or deletes the section.

Demo edition

Class 1 to 3 sections are checked; a Class 4 section is reported UNVERIFIED. The demo runs until 11 May 2027.

The engine of KUSOR-3D

Same section solver and Eurocode checker, with their validation tests.



Saved sections on the right: load one to bring it back in the sketcher

THANK YOU

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