

## PLII+

### Plate Buckling

PLII+ is a calculation software for the analysis of rectangular plates with or without bracing that are exposed to user-defined actions on the edges. Besides the verification of the structural safety, the user can merely calculate the buckling load factors and buckling coefficients in accordance with the linear buckling theory. The calculation of the buckling field is based on the Finite Element Method (FEM) in this analysis.

All examinations, including the calculation of the ideal buckling values, are performed on the entire field and include discrete longitudinal and transverse stiffeners. The effect of the stiffeners on the buckling behaviour is taken into account in all of these examinations. Therefore, verifications

for individual or partial fields or an additional verification of the minimum stiffness of stiffeners can be dispensed with. Buckling on a member that behaves like an Eulerian column can also be considered for the entire braced field, if applicable.

PLII+ allows you to calculate any number of load cases within the same item, including the following types of loads:

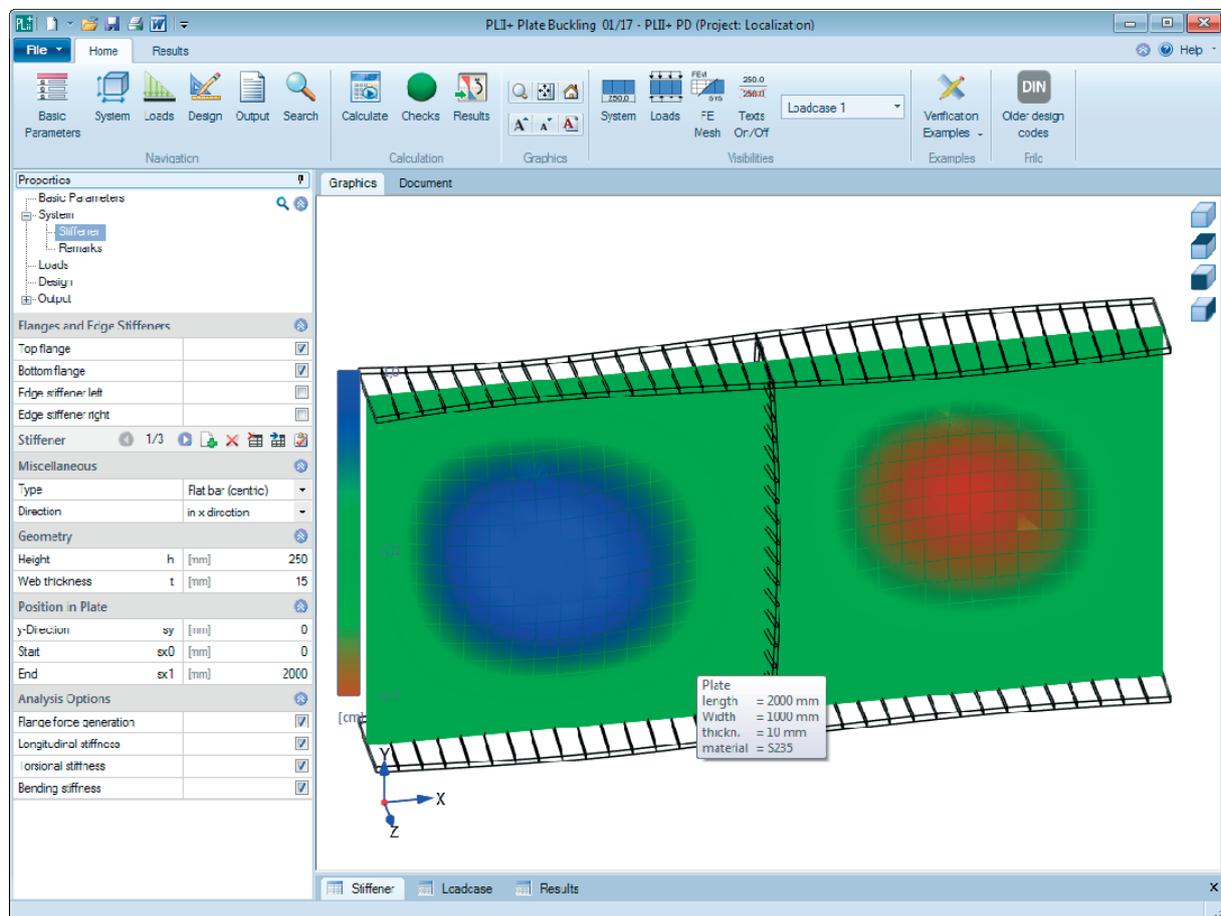
1. Identical trapezoidal line loads applying opposite to each other at the transverse edges
2. Identical trapezoidal line loads applying opposite to each other at the longitudinal edges
3. Two concentrated loads (e.g. wheel loads from crane operation) applying at the upper

edge of the buckling field

4. A freely definable reaction force applying at the bottom edge of the buckling field, e.g. supporting force of a bearing corbel
5. Constant circumferential edge shear load

The loading described in item 3 and 4 allows you to map also variable bending and shear stress distributions in the buckling field by calculating the plate loading on a cantilever or a single- or double-span beam pinned on two sides.

For structures that are not handled in the selected design code (e.g. one or several unsupported buckling field edges), linear buckling loads can be calculated sepa-



rately for all action components. This can optionally be done in an automatic calculation.

For purposes of illustration, PLII+ displays graphically the following calculation results for each load case. The displayed results depend on the selected design code, i.e. either with plate-type and Eulerian column-type behaviour (EN 1993-1-5) or with individual edge loads (DIN 18800):

Stress fields  $\sigma_x / \sigma_y / \tau_{xy} / \sigma_v$

Buckling mode associated to the lowest buckling load

By modelling flanges via the definition of edge stiffeners, you can also examine buckling and lateral torsional buckling stability problems on deformed cross sections. PLII+ delivers the ideal buckling loads with consideration to local buckling in compression-loaded web areas.

The results of such an examination strongly depend on the definition of the individual portions of the stiffeners' stiffnesses and their contribution to the load transfer.

### Special areas of application

The PLII+ software is especially suitable for the verification of the buckling safety of welded beams with very slender webs. The buckling risk may be attributable to the entire supporting behaviour (loading by bending and axial force) and/or locally transferred loads as with craneway beams.

### Standards

- DIN EN 1993-1-5/NA
- ÖNORM B 1993-1-5
- NA to BS EN 1993-1-5
- EN 1993-1-5