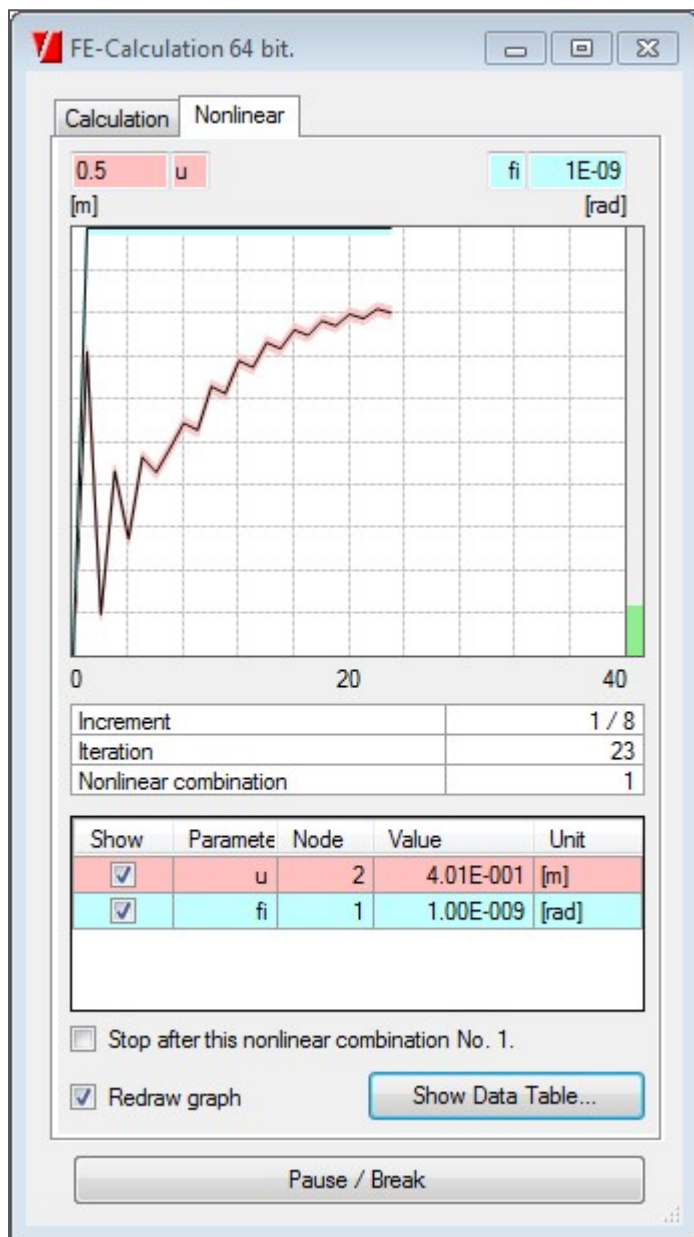


## Membrane Elements

**E** esas.37

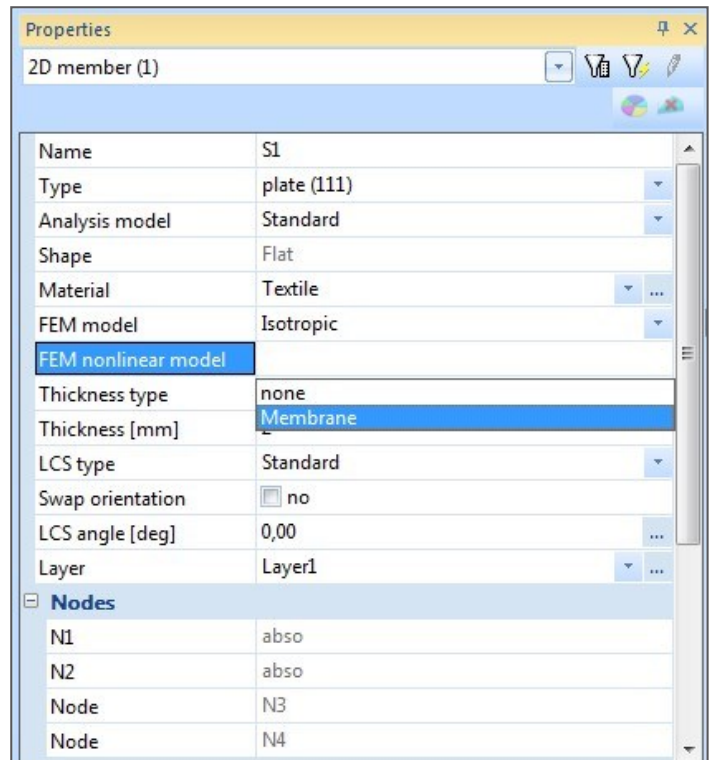
This module offers possibility to use membrane elements in the modelling and calculation. Membrane elements are defined as shell elements which have no flexural stiffness and no axial compression stiffness. Membrane elements can thus be used to model canvas, nets, etc. that are subjected to axial tension.

To obtain realistic results, a 2<sup>nd</sup> order calculation needs to be executed using the Newton-Raphson method.



### Highlights

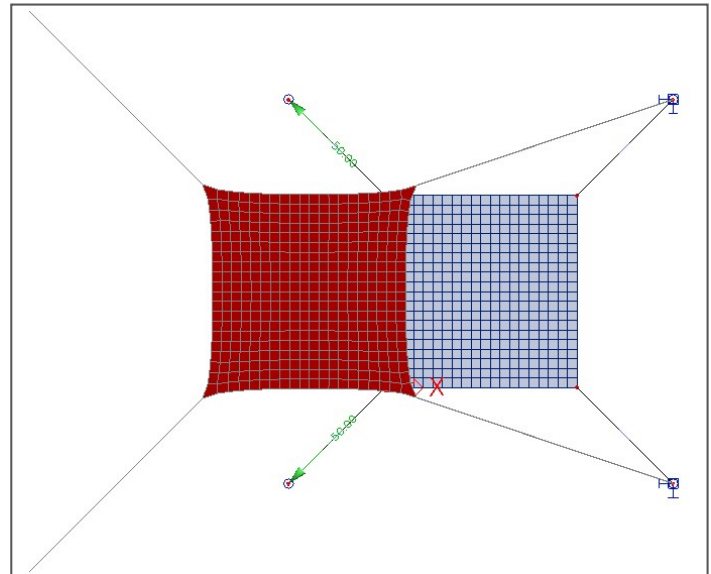
Calculation of shells as 2D-elements with tensile axial stiffness only.

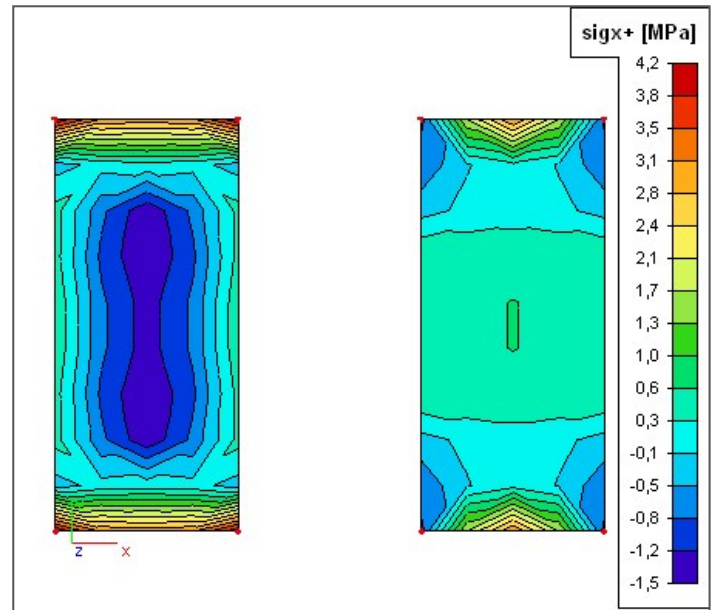
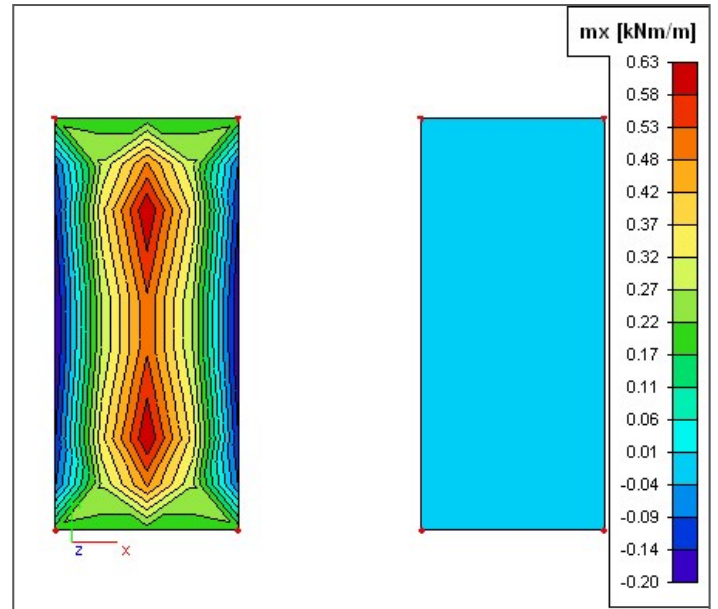
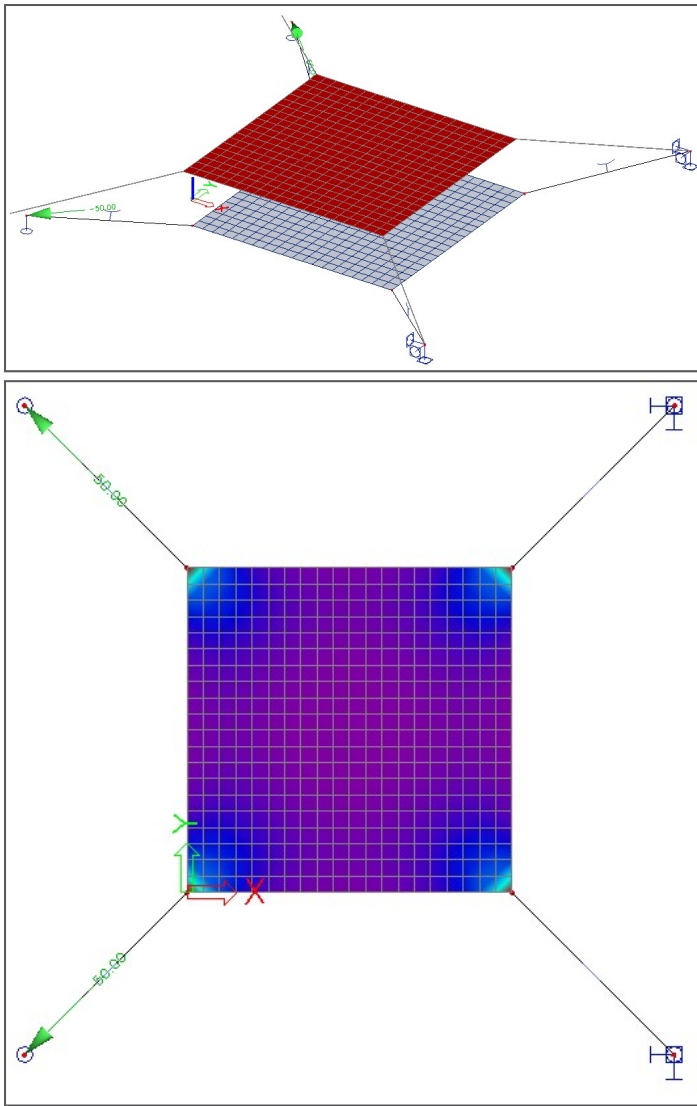


Properties

2D member (1)

Name	S1
Type	plate (111)
Analysis model	Standard
Shape	Flat
Material	Textile
FEM model	Isotropic
FEM nonlinear model	Membrane
Thickness type	none
Thickness [mm]	
LCS type	Standard
Swap orientation	<input type="checkbox"/> no
LCS angle [deg]	0,00
Layer	Layer1
<b>Nodes</b>	
N1	abso
N2	abso
Node	N3
Node	N4





## Differences in the results between membrane and standard element

The difference in the obtained results resulting from the application of the membrane behaviour can be best demonstrated on a simple example. Let us assume a rectangular plate made of a very thin sheet of steel. The left-hand side of the figure shows the results obtained for a standard 2D element. The right-hand side then contains the results for the membrane elements.

Note: Membrane elements can only be modelled in a General XYZ environment. Due to the fact the flexural rigidity is zero, no ribs, no prestressed tendons, orthotropic parameters or physical non-linear data can be inputted on a membrane element. Since a membrane element has no axial compression stiffness, no concrete calculation nor CDD can be performed on this type of element.

### Required modules

esas.00

