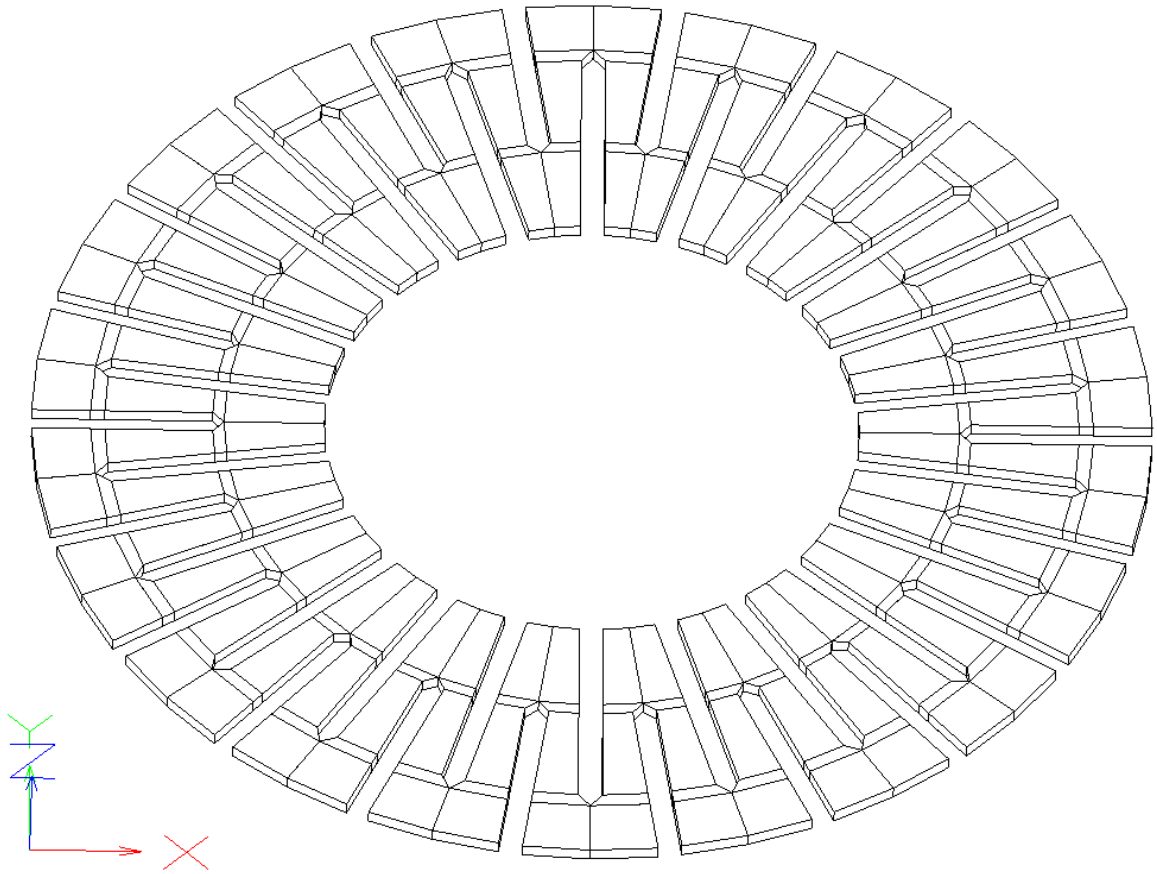
Z88 AURORA® EXAMPLE MANUAL

Example 8: RINGSPANN-pse

(Hexahedron No. 10 with 20 nodes)



8. Example: RINGSPANN-disc (Hexahedron number 10 with 20 nodes)

This example demonstrates the calculation of a RINGSPANN-disk. These are used as elastic coupling elements and looks like a slotted disc spring.

Attention: Springs with a linear characteristic curve can be calculated with linear elements but with a very low force or displacement. Then you can extrapolate to the real values. In case of disc springs the h/s ratio can effect extreme non linear characteristic curves that can be highly digressive. This describes geometrical non-linear material characteristics which can be calculated with commercial FEA-programs.

But also a linear FEA-program can be used to solve geometric non-linear problems. Therefore the load must be divided into, for example 10 load steps. In the first calculation step the load is 1/10 of the total load. The displacements of this step are added to the original structure. In the next step you have a deformed structure and the load is again 1/10 of the total load. This goes on till the total load is reached and the result is a non-linear characteristic curve. But we will not do this.

input files:

b9_1.txt → common structure data

b9_2.txt → boundary conditions

b9_3.txt → control parameters for stress calculation

To create a new project, use  , Create Folder promt e.g. "*Example_8"*, confirm with *Enter* and exit the dialog with *OK*. Now you must import the example files above. For that reason use the Import/Export function of Z88 Aurora (*Figure 1*).

There you choose Z88-File. For the first file *b9_1.txt* you have to choose "*structural information z88i1.txt*", for the second file *b9_2.txt* "*Boundary conditions z88i2.txt*" and for the third "*Stress parameters Z88i3.txt*".

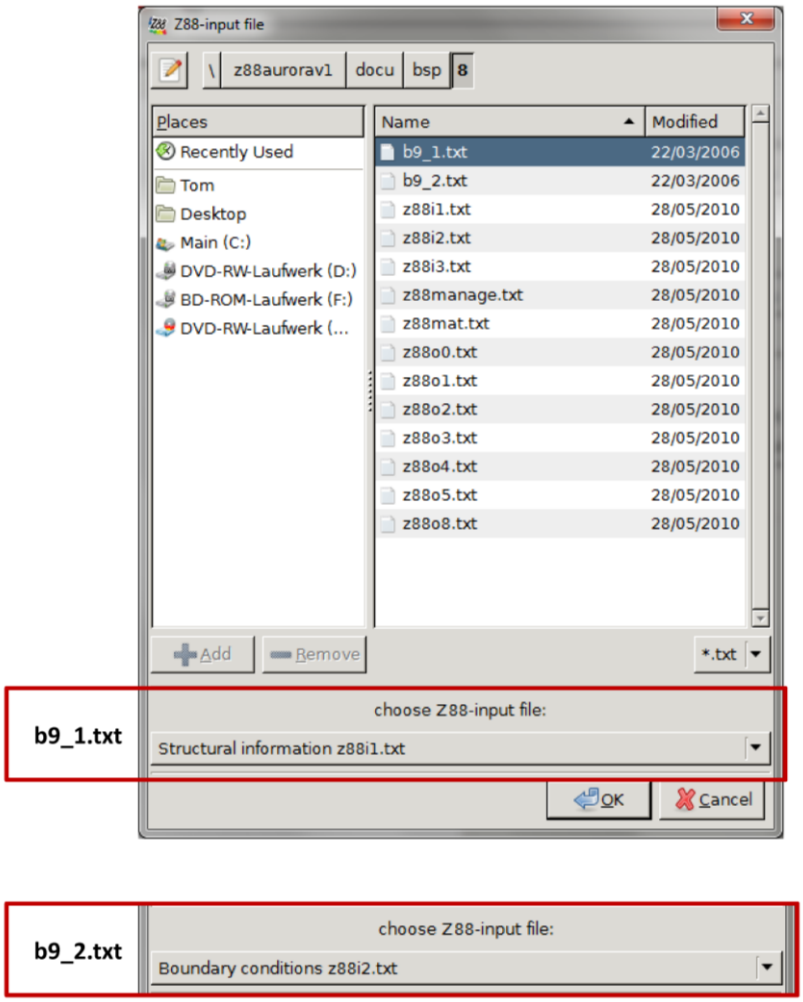


Figure 1: Import structure data and boundary conditions

Switch to the preprocessor using the button. There you can see that a load case already exists. If you choose it, the boundary conditions are displayed and on the right side of the window the kind of condition are shown (*Figure 2*).

To calculate the example, you have to switch to the solver view using the button. It is strongly suspected that the numbering of the nodes is disadvantageous, because it is a round closed structure. Nodes with high and low numbers are nearby which causes a ill-conditioned global stiffness matrix (see also the Theory Manual).

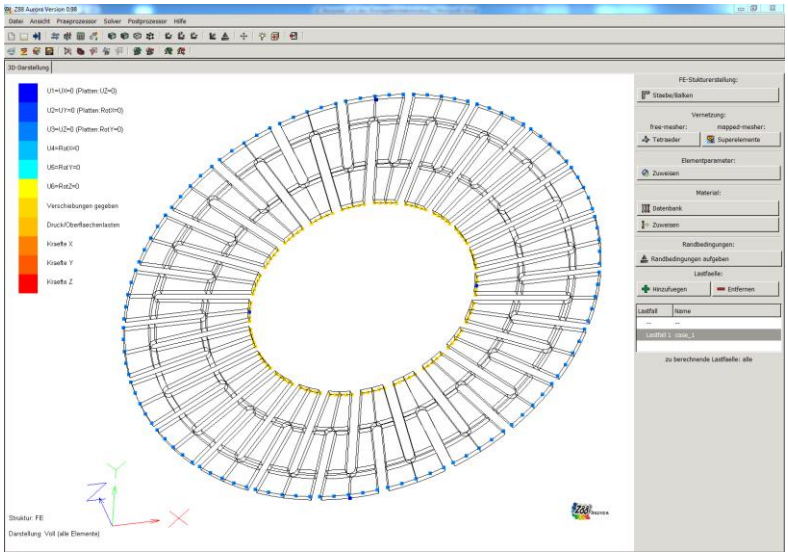


Figure 2: RINGSPANN-disc with boundary conditions

To avoid this you can use the option "*Node sort*" (Cuthill-McKee-algorithm) into the solver option menu which can be open with Options. To start the direct Cholesky solver use RUN. When the solver has finished you can look at the results in the postprocessor using (*Figure 3*).

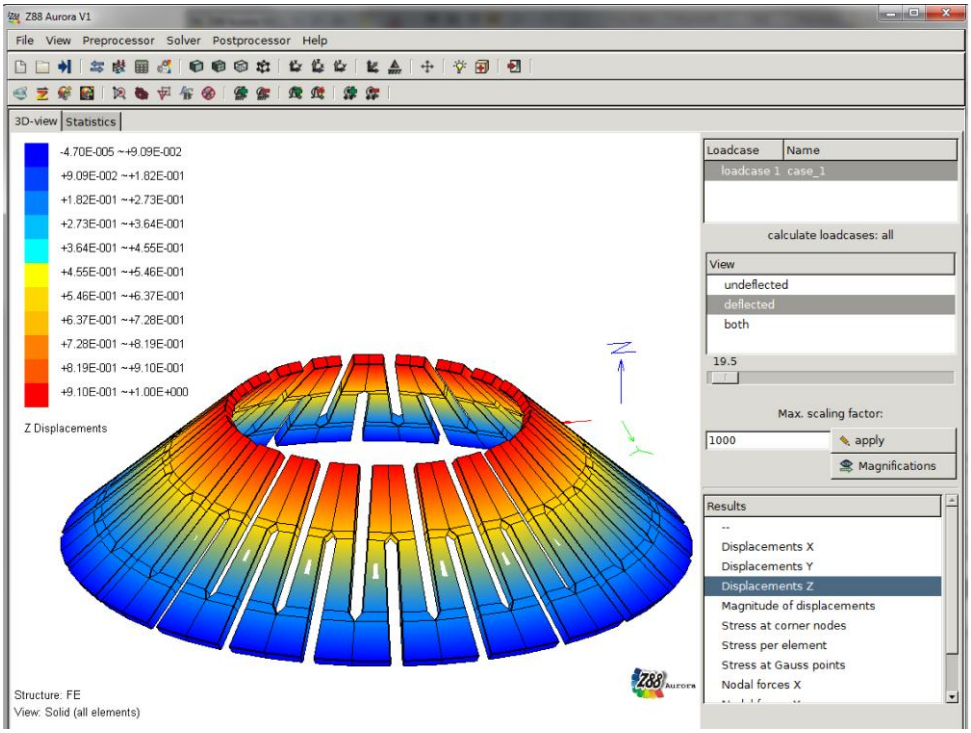


Figure 3: Plot of the displacements