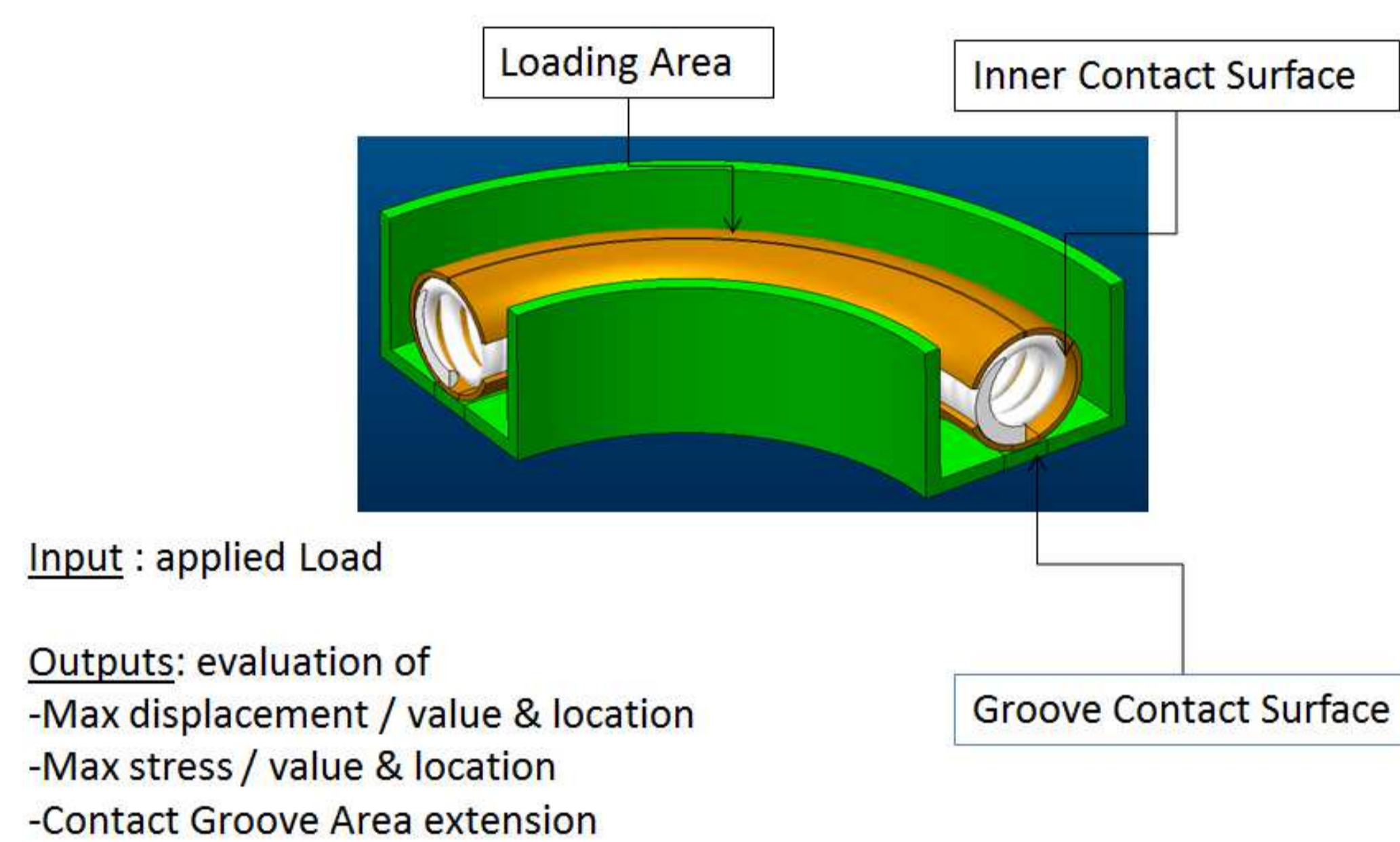


# Toroidal Elicoidal Spring: sealing performance analysis

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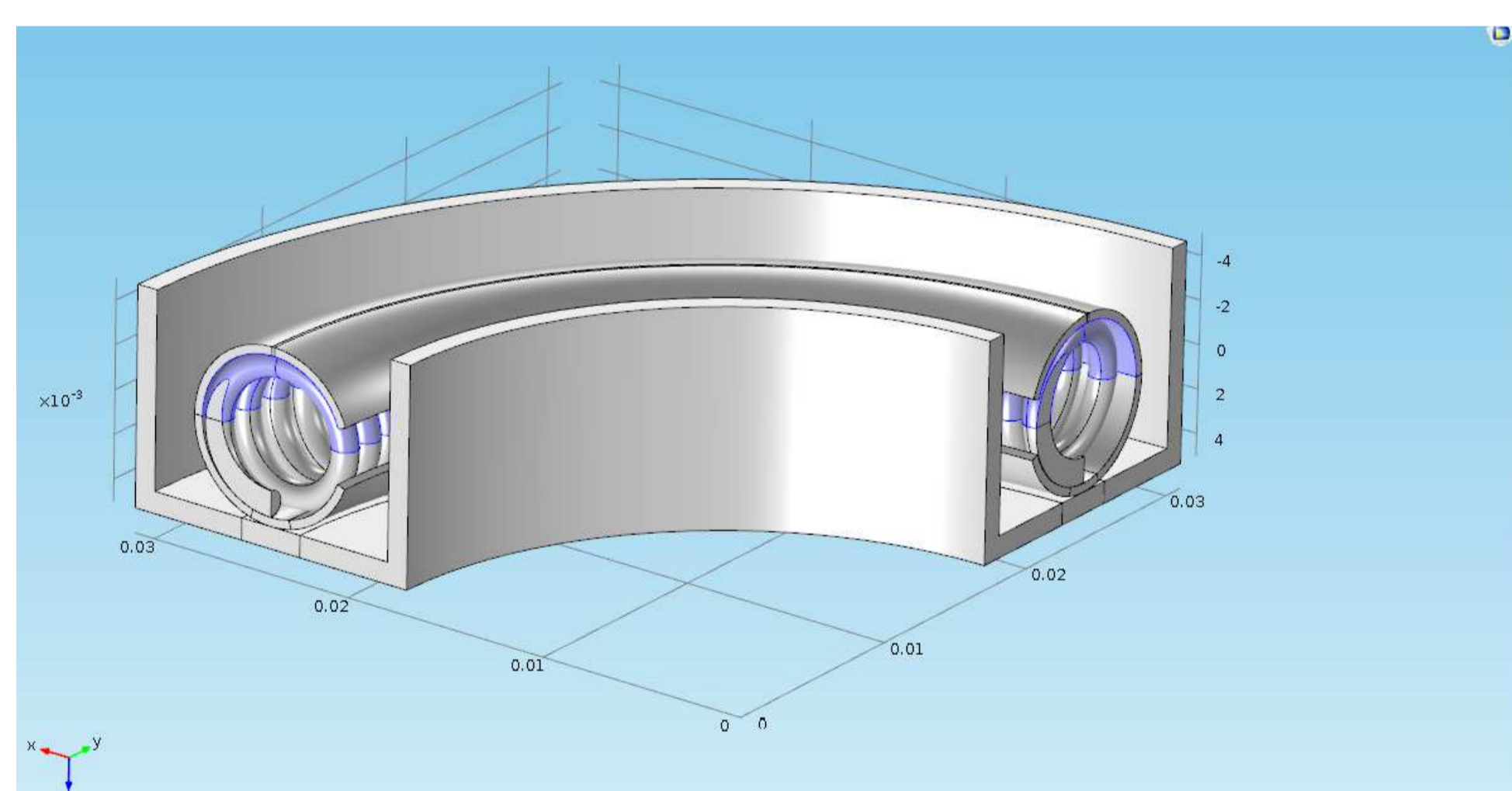
**Introduction:** The sealing behavior of a Toroidal Elicoidal Spring (TES) has been analyzed in COMSOL Multiphysics to understand the displacements and stresses, as metal seal of a static flanged connection. This gasket is intended to be used as metal seal between the body flange and the cover flange of valves, where a low precompression is required at its top.



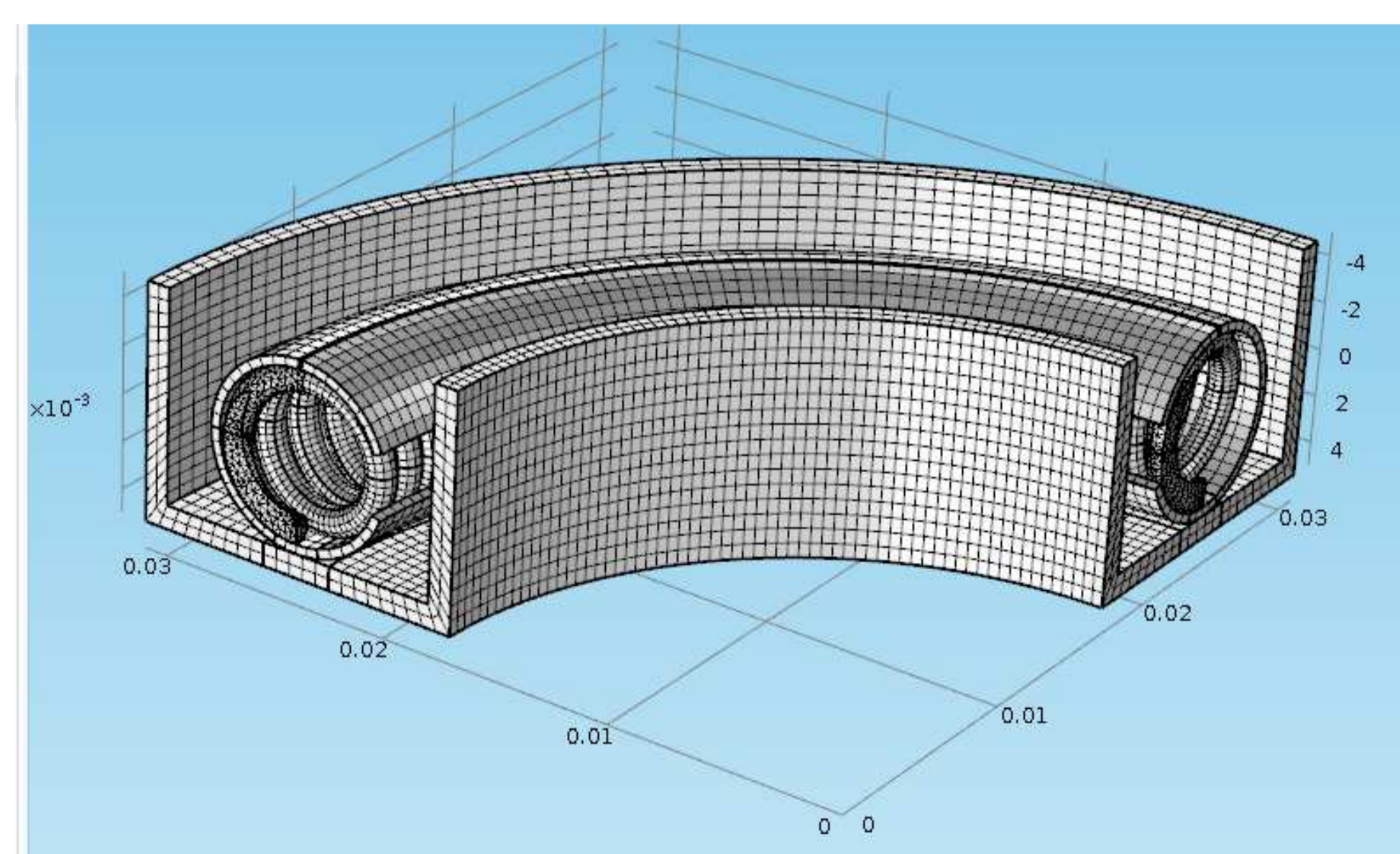
**Figure 1.** Creo PTC 3D Model and specifications

**Computational Methods:** One-Quarter of the 3D model has been analyzed, considering the cyclic symmetry in geometry and load on the top, then symmetry constraints have been used at the cutted surfaces. The analysis has been performed as Non-Linear, due to:

- the geometric contacts between parts;
- the material behavior

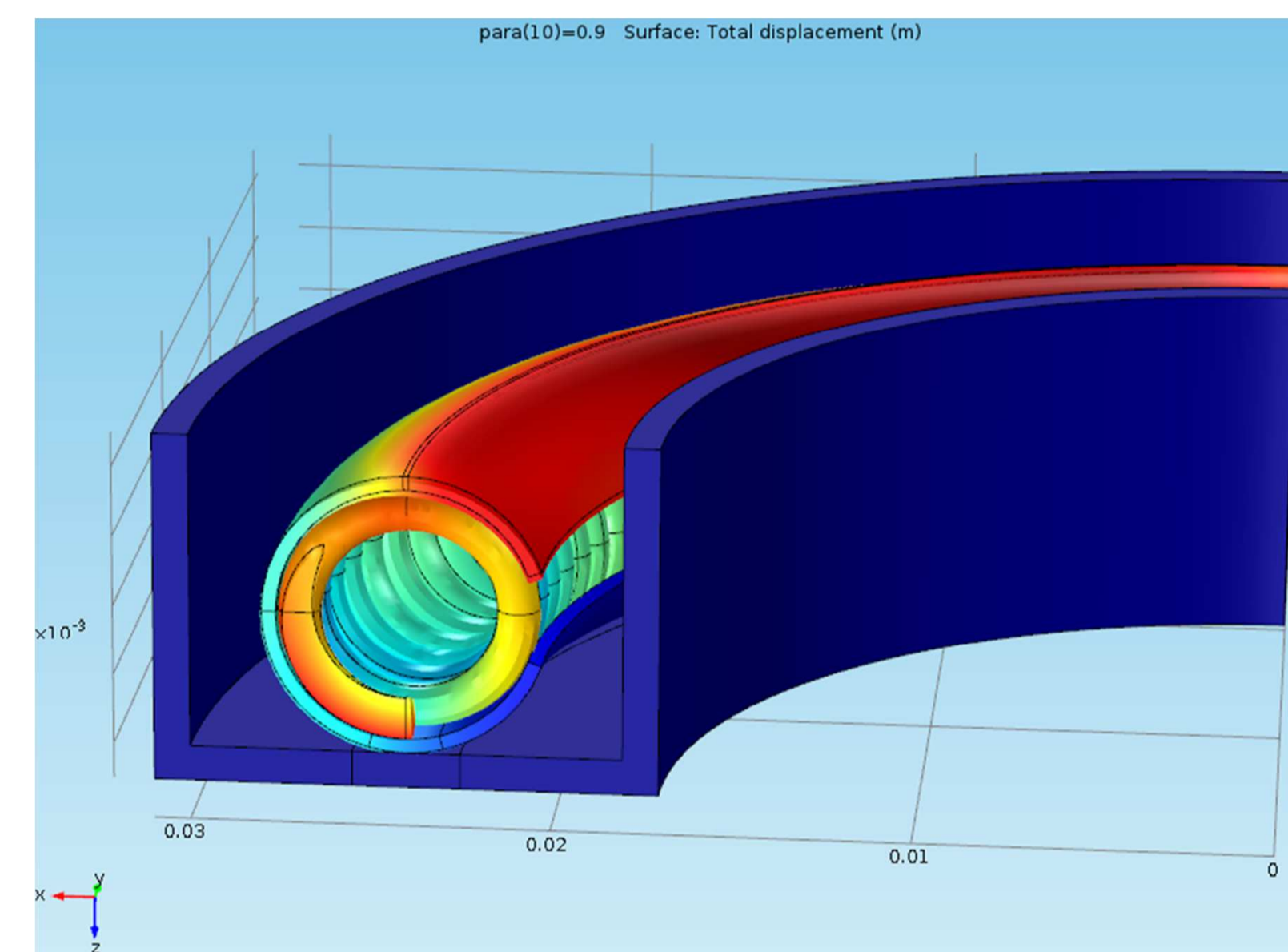


**Figure 2.** Example of one of the three contacts pairs set up in the model



**Figure 3.** Mesh

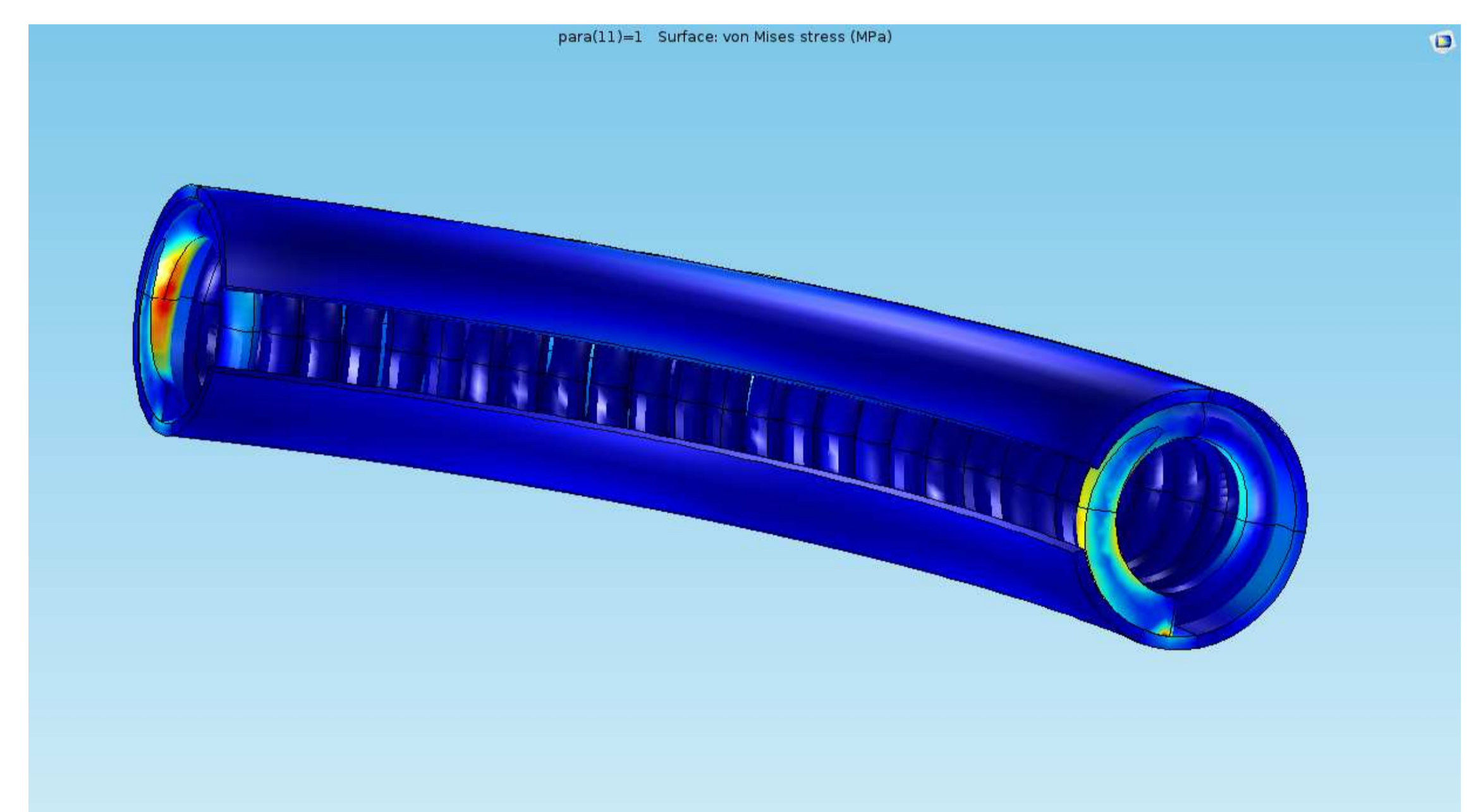
**Results:** The total applied load of 200 MPa shows very small displacements and stresses lower than the allowed yield limit in the areas of interest but a plastic deformation in the external casing has been found in the contact groove as expected.



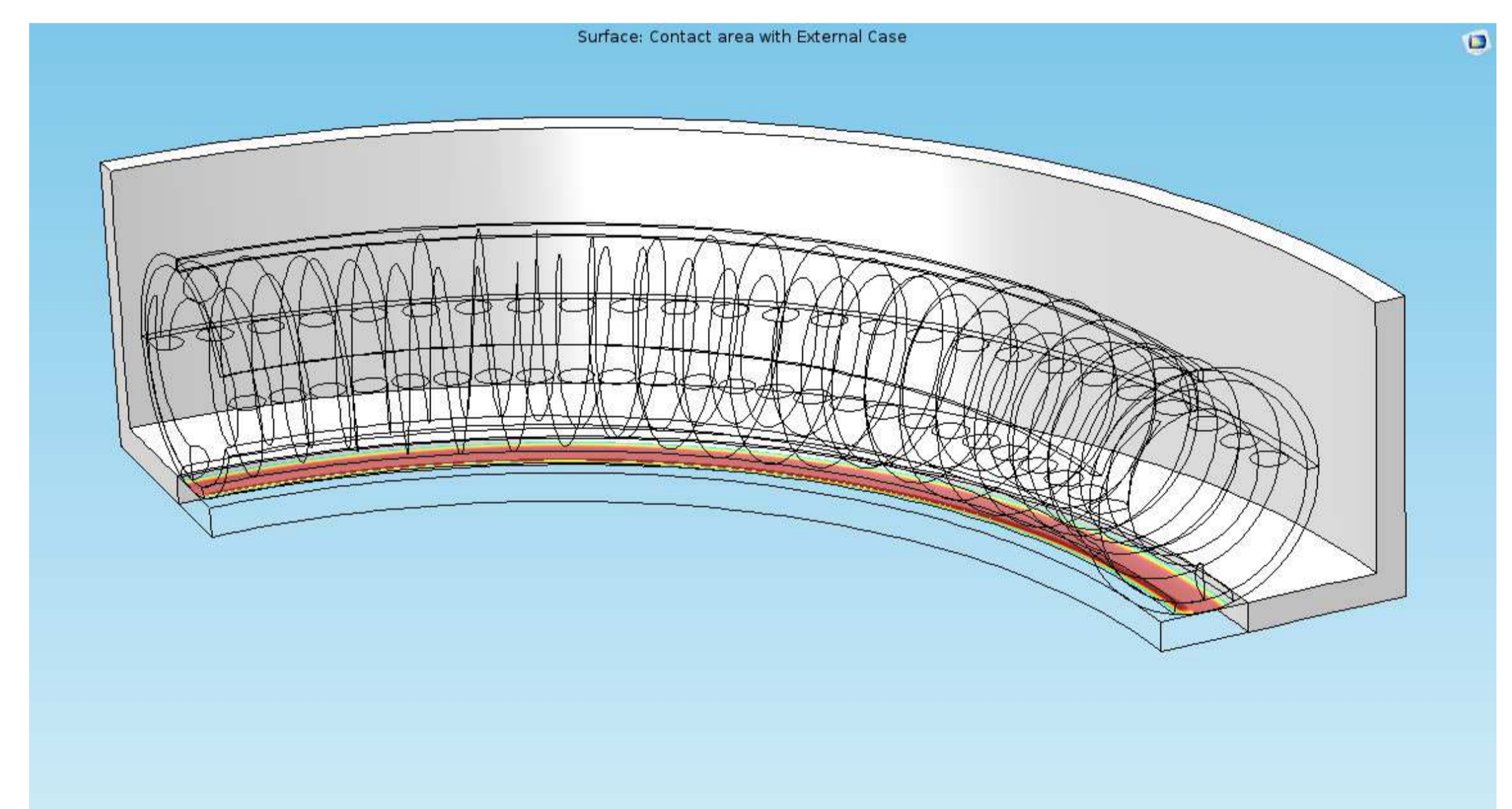
**Figure 4.** Total displacement

Variable	Value	Units
Load applied	25.48	N/mm
Max Von Mises	~ 200	MPa
Max displacement	~ 0.9	mm
Yield Stress	250-300	MPa

**Table 1.** Table of data



**Figure 5.** Von Mises stresses



**Figure 6.** Groove contact surface

**Conclusions:** Even with a low imposed load FL, the analysis confirms that the contact surface is subjected to a local plastic deformation, which should assure the sealing. The corresponding stress and strain are contained in the allowed limits. An experimental activity will be made in the next future, to validate the FEA results