Exercise 16

A MEMS switch consists of aluminium. Aluminium has a Youngs Modulus $E = 6.8e9\,\mathrm{Pa}$ and a Poissons Ratio $v = 0.35$. The structure to be simulated is depicted in Fig. 1. The thickness of the switch is $120\,\mu\mathrm{m}$.

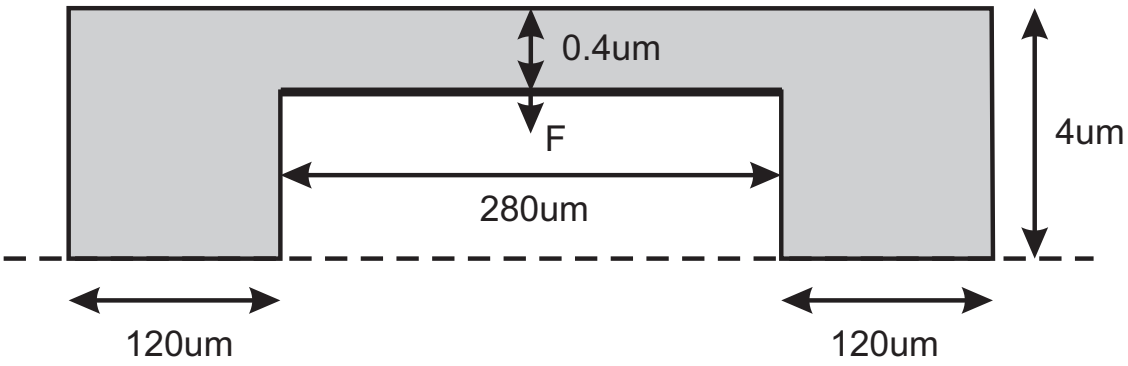

Figure 1: MEMS switch consisting of aluminium.

1. Is this a plane stress or a plane strain problem?
2. What are the boundary conditions for this problem?
3. Which type of mesh cells should one use?
4. Which surface force do we need to bend the membrane $1\,\mu$m?.

Solution 16

1. It is a plane strain problem.
2. Where the switch is mounted to the substrate Dirichlet BC are applied. All other boundaries are Neumann BC.
3. Because of the large aspect ratio one should use rectangular mesh cells.
4. One needs approx. $4\,\mathrm{mN/m}$.