

Maximum shear stress

Let us consider a tensile test as in figure 1. During the test, the stress state is homogeneous within the part Ω of a material sample. For any material point of Ω , the local stress tensor is:

$$\underline{\underline{\sigma}} = 100 \cdot \underline{e}_1 \otimes \underline{e}_1 \quad (1)$$

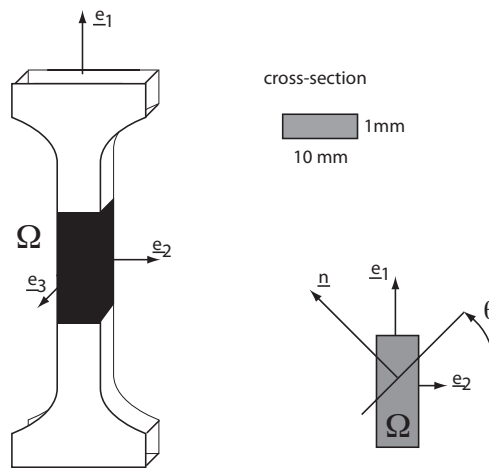


Figure 1: Tensile test. We assume an homogeneous stress state within the central part of the sample.

Question 1 Calculate the global force \underline{F} that is applied on the material sample by the experimental tensile device.

Question 2 We cut the sample by a “fictive” plane. The orientation of this plane is denoted by the angle θ between the \underline{e}_2 axis and the unit normal vector \underline{n} . Calculate as a function of θ the stress vector applied on this surface.

Question 3 Find the value of θ for which the shear stress is maximum.