Electronic Instrumentation
Problem sheet: Gauge

2011/2012 module 2

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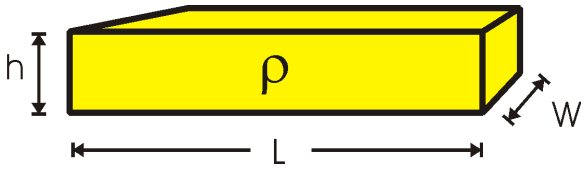
MIEET 3º ano



A strip resistor of length *L*, width *W* and height *h*, made of a material with resistivity ρ (see picture above) has a resistance value of

$$R = \frac{\rho L}{Wh} .$$

The gauge factor is defined as

$$k \equiv \frac{dR/R}{dL/L}$$

- Show that the gauge factor *k* for a strip resistor with all parameters *W*, *h* and ρ functions of *L* is equal to

$$k = 1 + 2\nu + \frac{d\rho/\rho}{\varepsilon_L} ,$$

with ε_L the strain along L ($\varepsilon_L = dL/L$), and ν Poisson's ratio defined as

$$\nu \equiv -\frac{dW/W}{dL/L} = -\frac{dh/h}{dL/L} .$$

- What is the gauge factor *k* for a material that has the property that the volume doesn't change when its length is altered (assume constant ρ),

$$\frac{dV}{dL} = 0 .$$

- A strip resistor of 1 kΩ is extended 1% in length. What is the new resistance value? (Assume constant volume and no Piëzo effect).