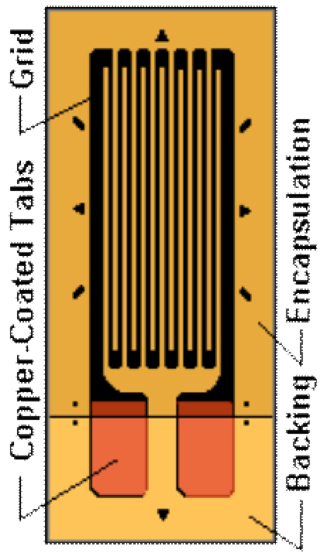


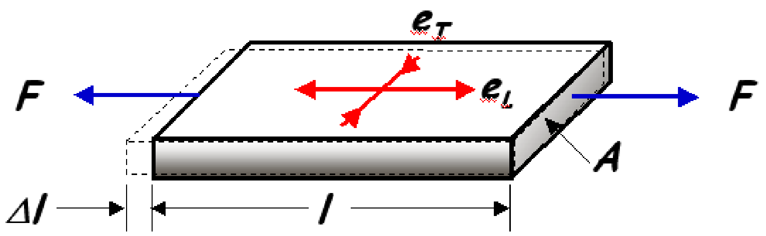
Characteristics:

1) able to measure strains of $\pm 1\ \mu m/m$
2) small in size and light in weight
3) able to response to high frequency signals
4) wide range of *linear* response
5) has stable calibration constant (gage factor)
6) flexible in use and wide range applications
7) low in cost
8) easy compensation to various factors

Transverse strain ***Axial strain***

$$e_T = -\nu\, e_L$$

Poisson's ratio



Elastic Modulus: $E = \dfrac{\sigma \ \text{(stress)}}{e \ \text{(strain)}}$

Material resistivity

The resistance of a strain gage: $R = \dfrac{\rho l}{A}$ ← ***Element length*** ← ***Cross section area***

When a strain gage is strained, the change in resistance is:

$$\Delta R = \left(\frac{\partial R}{\partial l}\right)\Delta l + \left(\frac{\partial R}{\partial A}\right)\Delta A + \left(\frac{\partial R}{\partial \rho}\right)\Delta \rho$$

Relative change in resistance: $\dfrac{\Delta R}{R} = \dfrac{\Delta l}{l} - \dfrac{\Delta A}{A} + \dfrac{\Delta \rho}{\rho}$

Because: $\dfrac{\Delta l}{l} = e_L$; $\quad \dfrac{\Delta A}{A} = 2\dfrac{\Delta D}{D} = 2\,e_T = 2\,(-\upsilon\, e_L)$

Poisson's ratio

Then: $\dfrac{\Delta R}{R} = (1 + 2\nu) e_L + \dfrac{\Delta \rho}{\rho}$

Define a **Gage factor** Ks: $Ks = \dfrac{\Delta R / R}{e_L}$

Gage factor of a strain gage:

$$Ks = 1 + 2\nu + \frac{\Delta \rho}{e\ \rho}$$

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