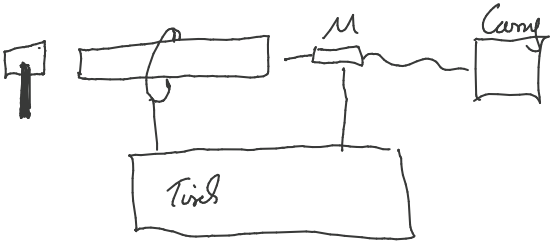

$v_L = \sqrt{\frac{E}{\rho}}$ $\rho = \frac{M}{V}$ $\lambda = \frac{v}{f} \Rightarrow f = \frac{v}{\lambda} = \frac{v}{2L}$

$\Rightarrow v = f \cdot 2L$

$\Rightarrow v_L^2 \cdot \rho = E = f^2 2^2 L^2 \cdot \frac{M}{\pi (\frac{D}{2})^2 \cdot L} = 16 f^2 \cdot L \cdot \frac{M}{\pi (\frac{D}{2})^2}$

$E = \frac{F/A}{\frac{\Delta L}{L}} = \frac{m \cdot a}{\frac{\Delta L}{L} \cdot A} = a \cdot L \cdot \frac{m}{\Delta L \cdot A}$

$v = \sqrt{\frac{E}{\mu}} = \sqrt{\frac{E \cdot A \cdot \Delta L / f}{\frac{M}{L}}} = \sqrt{E \cdot \frac{A \cdot \Delta L}{M}}$

$= \sqrt{\frac{E}{\rho}}$

$\sigma^2 = \sum_i \sigma_i^2$ $\mu = \sum_i \mu_i$

Für Messfehler: $\mu = \frac{1}{n} \sum_i x_i$

$\sigma = \sum_i (x_i - \mu)^2 \cdot \frac{1}{n-1}$

$\sigma_\mu = \frac{\sigma}{\sqrt{n}}$ $\sigma_\sigma = \frac{\sigma}{\sqrt{2(n-1)}}$