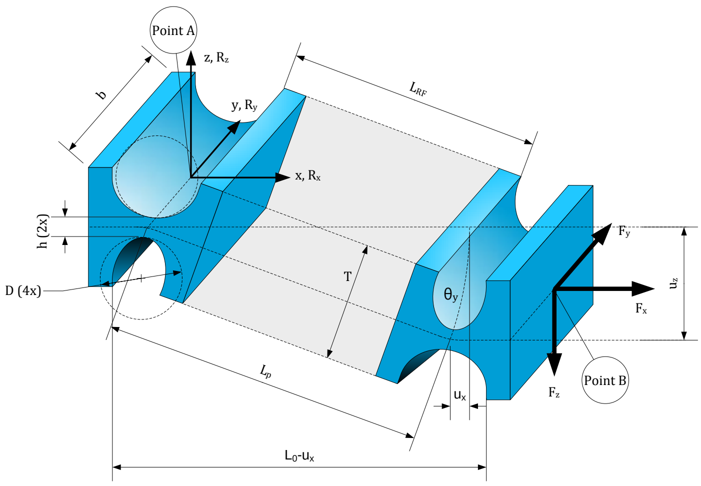
Usage

Used as a stiff alternative (C_x) for a leaf spring. Note that stiffness in other directions increase as well.



2 elastic hinges in series and in s-shape deformation.

Geometric & motion characteristics

$L_P = \frac{L_0+L_{RF}}{2}$

$\beta = \frac{h}{D}$

$L_{RF}^{\#} = L_P - \sqrt{(h-T)(T-h-2D)}$

If hinge geometry is of shape 1 or 3 (see below)

$u_z = \frac{F_z}{C_{Bz}}$

$u_x^{*} = \frac{1}{2} * \frac{u_z^2}{L_P}$ — * *s-shape and if* $u_z \ll L$

$u_x^{**} = \frac{u_z^2}{L_P}$ — ** *c-shape and if* $u_z \ll L$

$\theta_y^{***} \approx \frac{u_z}{L}$ — *** *s-shape and if* $u_z \ll L$

$\theta_y^{****} \approx \frac{u_z}{2L}$ — **** *c-shape and if* $u_z \ll L$

Stiffness at point B

$$C_{Bx} = \frac{6Eb\sqrt{\beta}T^3}{25T^3+72\sqrt{\beta}L_{RF}{}^3}$$

$$C_{By} = \frac{47Eb^3\beta}{188b^2(1+\nu)+1000L_P{}^2\left(1.2\sqrt{\beta}+\frac{1}{\beta}\right)+47\frac{\beta}{T}L_{RF}^3}$$

$$C_{Bz\text{s-shape}} = \frac{651Eb\beta\sqrt{\beta}}{2790\beta+2325+875\beta\left(\frac{L_P}{h}\right)^2+2604\beta\sqrt{\beta}\left(\frac{L_{RF}}{T}\right)^3}$$

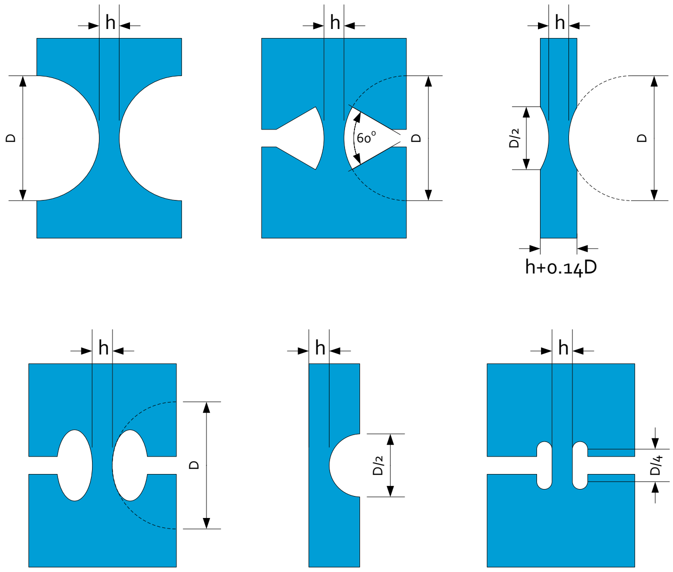
$$C_{Bz\text{c-shape}} = \frac{651Eb\beta\sqrt{\beta}}{2790\beta+2325+7000\beta\left(\frac{L_P}{h}\right)^2+2604\beta\sqrt{\beta}\left(\frac{L_{RF}}{T}\right)^3}$$

$$K_{Bx} = \frac{Ebh^2T^3\sqrt{\beta}}{50T^3+6L_{RF}b^2\sqrt{\beta}(1+\nu)}$$

$$K_{By} = \frac{Ebh^2T^3\sqrt{\beta}}{2000T^3+1116L_{RF}h^2\sqrt{\beta}}$$

$$K_{Bz} = \frac{47ET\beta\sqrt{\beta}b^3}{2000T(1.2\beta+1)+564L_{RF}\beta\sqrt{\beta}}$$

Versions with equal h, C_x and K_y



Stress

Determinative for the stroke θ_y:

$\sigma_{max}^{*} = 0.58E\sqrt{\beta} * \theta_y$ — * *s-shape*

$\sigma_{max}^{**} = 0.58E\sqrt{\beta} * \frac{\theta_y}{2}$ — ** *c-shape*

Source:
- Constructieprincipes, voor het nauwkeurig bewegen en positioneren, M.P. Koster. ISBN 978-90-5574-610-1