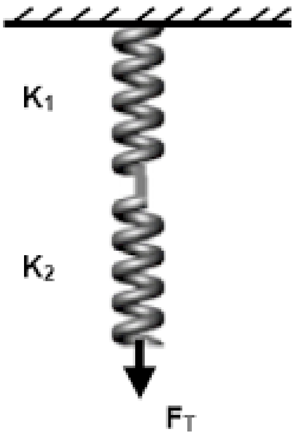
K equivalent-when springs are in series

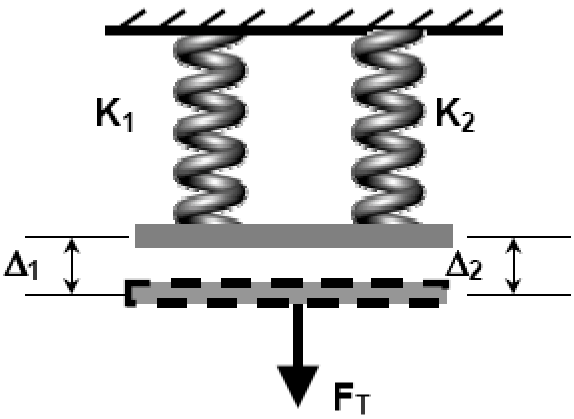


$$F_T = F_1 = F_2$$

$$\Delta_T = \Delta_1 + \Delta_2 = \frac{F_1}{K_1} + \frac{F_2}{K_2} = \frac{F_T}{K_1} + \frac{F_T}{K_2}$$

$$Keq = \frac{F_T}{\Delta_T} = \frac{F_T}{\Delta_1 + \Delta_2} = \frac{F_T}{\frac{F_T}{K_1} + \frac{F_T}{K_2}} = \frac{1}{\frac{1}{K_1} + \frac{1}{K_2}}$$

Kequivalent-when springs are in parallel
PARALLEL(SYMMETRIC DISPLACEMENTCASE)
($\Delta 1 = \Delta 2$)

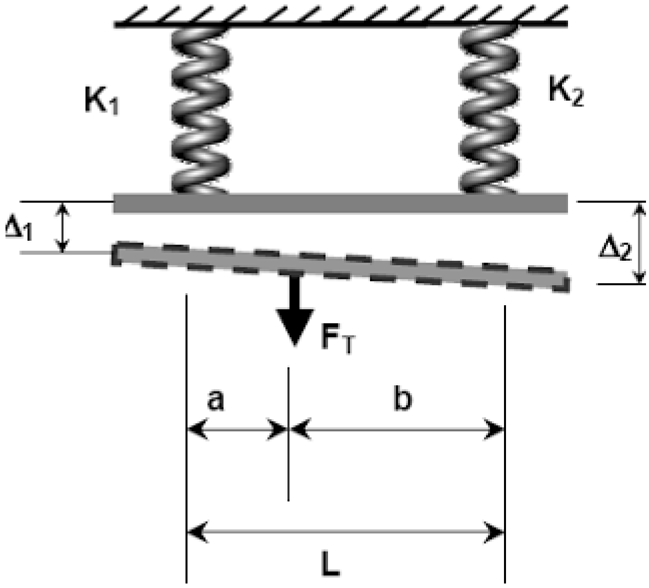


$$\Delta_T = \Delta_1 + \Delta_2$$

$$F_T = F_1 + F_2 = K_1\Delta_1 + K_2\Delta_2 = K_1\Delta_T + K_2\Delta_T$$

$$Keq = \frac{F_T}{\Delta_T} = \frac{K_1\Delta_T + K_2\Delta_T}{\Delta_T} = K_1 + K_2$$

UNSYMMETRICAL DISPLACEMENT(Δ1, Δ2, ΔTOTAL) WHEN THE SPRINGS ARE IN PARALLEL (Δ1≠ Δ2)



$$F_T = F_1 + F_2$$

$$F_1 = \frac{b}{L} F_T; \qquad F_2 = \frac{a}{L} F_T$$

$$\boxed{\Delta_T = \frac{b}{L}\Delta_1 + \frac{a}{L}\Delta_2} = \frac{b}{L}\frac{F_1}{K_1} + \frac{a}{L}\frac{F_2}{K_2}$$

$$= \frac{b^2}{L^2}\frac{F_T}{K_1} + \frac{a^2}{L^2}\frac{F_T}{K_2}$$

$$Keq = \frac{F_T}{\Delta_T} = \frac{F_T}{\frac{b^2}{L^2}\frac{F_T}{K_1} + \frac{a^2}{L^2}\frac{F_T}{K_2}} = \frac{L^2}{\frac{b^2}{K_1} + \frac{a^2}{K_2}}$$