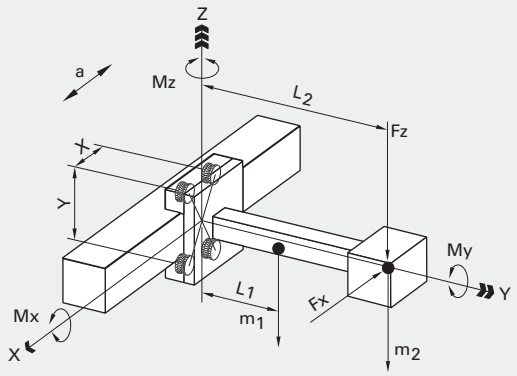
Linear Motion System Calculations

Application A (horizontal)



Static design:

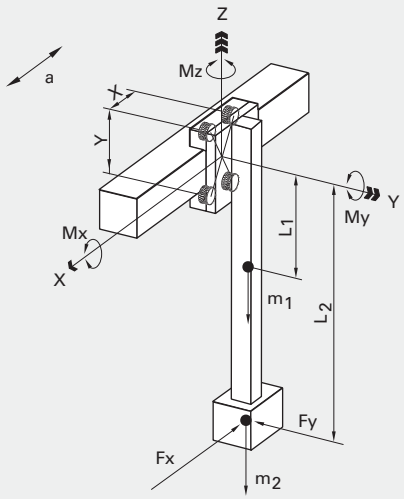
$$M_{X\,max.} = 2*F_A*A \qquad F_{Z\,max.} = \frac{M_{X\,max.} - g\,(m_1 * L_1 + m_2 * L_2)}{L_2}$$

$$M_{Z\,max.} = 2*F_A*X \qquad F_{X\,max.} = \frac{M_{Z\,max.}}{L_2}$$

Dynamic design:

$$a_{max.} = \frac{F_A * X}{(m_1 * L_1 + m_2 * L_2)*4} - \frac{g*X}{9*Y}$$

Application B (horizontal)



Static design:

$$M_{X\,max.} = 2*F_A*A \qquad F_{Y\,max.} = \frac{M_{X\,max.}}{L_2}$$

$$M_{Y\,max.} = \left(F_R - \frac{(m_1+m_2)*g}{2}\right) * \left(\sqrt{x^2+y^2} - 0.036\right) \qquad F_{X\,max.} = \frac{M_{Y\,max.}}{L_2}$$

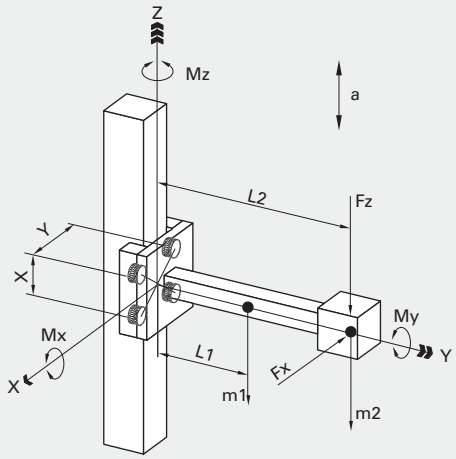
Dynamic design:

$$a_{max.} = \frac{\left(F_R - \frac{(m_1+m_2)*g}{2}\right) * \left(\sqrt{x^2+y^2} - 0.036\right)}{(m_1*L_1+m_2*L_2)*2}$$

$$F_{a\,req.} = (m_1+m_2)*a_{max.} + 10\ N$$

$$M_{d\,hor\,req.} = F_{a\,req.}*0.035\ m*1.8$$

Application C (vertical)



Static design:

$$M_{X\,max.} = 2*F_A*X \qquad F_{Z\,max.} = \frac{M_{x\,max.} - g*(m_1*L_1 + m_2*L_2)}{L_2}$$

$$M_{Z\,max.} = 2*F_A*Y \qquad F_{X\,max.} = \frac{M_{x\,max.}}{L_2}$$

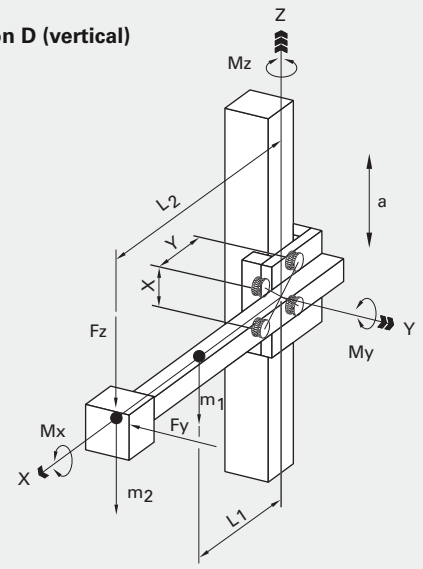
Dynamic design:

$$a_{max.} = \frac{2*F_A*X}{(m_1*L_1+m_2*L_2)*2} - g$$

$$F_{a\,req.} = (m_1+m_2)*(a_{max} + g) + 10\ N$$

Linear Motion System Calculations

Application D (vertical)



Static design:

$$M_{Y\,max.} = FR * (\sqrt{x^2+y^2} - 0.036) \qquad F_{Z\,max.} = \frac{M_{Y\,max.} - g\,(m_1*L_1+m_2*L_2)}{L_2}$$

$$M_{Z\,max.} = 2*F_A*Y \qquad F_{Y\,max.} = \frac{M_{Z\,max.}}{L_2}$$

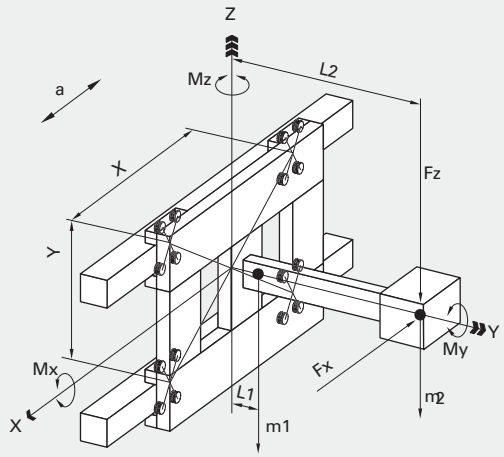
Dynamic design:

$$a_{max.} = \frac{F_R*(\sqrt{x^2+y^2} - 0.036)}{(m_1*L_1+m_2*L_2)*2} - g$$

$$F_{a\,req.} = (m_1+m_2)*(a_{max.} + g)\ 10\ N$$

$$M_{d\,ver\,req.} = F_{a\,req.}*0.035\ m*1.8$$

Application E (horizontal)



Static design:

$$M_{X\,max.} = 8*F_A*(y - 0.15) \qquad F_{Z\,max.} = \frac{M_{X\,max.} - g\,(m_1*L_1+m_2*L_2)}{L_2}$$

$$M_{z\,max.} = 4*F_A*X \qquad F_{X\,max.} = \frac{M_{Z\,max.}}{L_2}$$

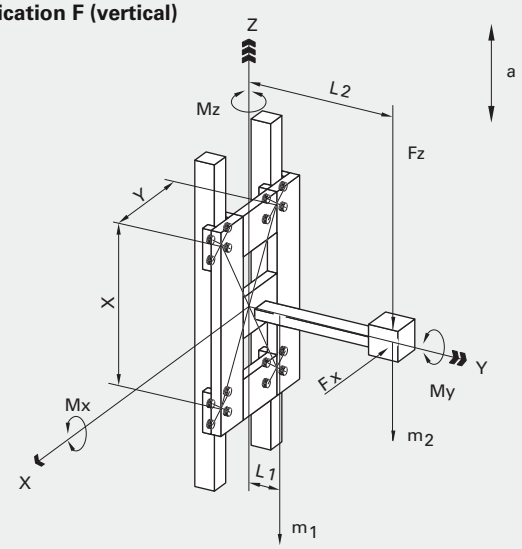
Dynamic design:

$$a_{max.} = \frac{4*F_A*X}{(m_1*L_1+m_2*L_2)*2}$$

$$F_{a\,req.} = (m_1+m_2)*a_{max.} + 40\ N$$

$$M_{d\,hor\,req.} = F_{a\,req.}*0.035\ m*1.8$$

Application F (vertical)



Static design:

$$M_{X\,max.} = 4*F_A*X \qquad F_{Z\,max.} = \frac{M_{x\,max.} - g*(m_1*L_1+m_2*L_2)}{L_2}$$

$$M_{Z\,max.} = 4*F_A*Y \qquad F_{X\,max.} = \frac{M_{z\,max.}}{L_2}$$

Dynamic design:

$$a_{max.} = \frac{4*F_A*X}{(m_1*L_1+m_2*L_2)*2} - g$$

$$F_{a\,req.} = (m_1+m_2)*(a_{max.} + g) + 40\ N$$

$$M_{d\,ver\,req.} = F_{a\,req.}*0.035\ m*1.8$$