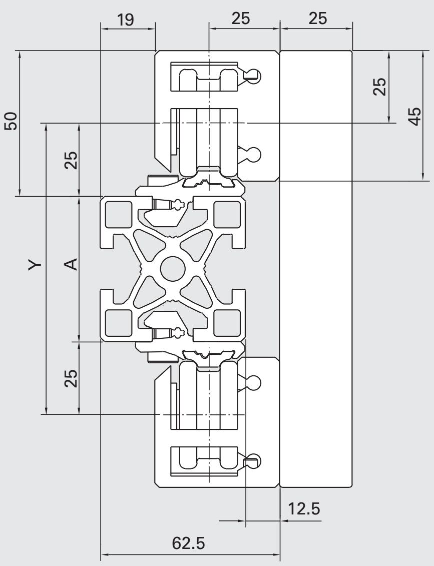
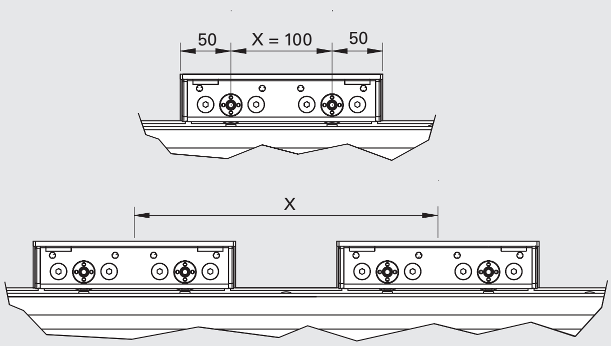
# Linear Motion System Description Key

| | | |
|---|---|---|
| $F_{(x,y,z)\ max.}$ | [N] | maximum rated external static load |
| $F_{(x,y,z)}$ | [N] | actual external static load |
| $F_R$ | [N] | maximum rated load / roller - radial (max. 1500 N) |
| $F_A$ | [N] | Maximum rated load / roller - axial (max. 750 N) |
| $M_{(x,y,z)\ max.}$ | [Nm] | maximum rated static torque load |
| $a_{max.}$ | [m/s$^2$] | maximum rated acceleration |
| X | [m] | distance between rollers in direction of motion |
| Y | [m] | distance between rollers perpendicular to direction of motion |
| A | [m] | extrusion width between rollers |
| g | [m/s$^2$] | gravitational acceleration (approx. 9.81 m/s2) |
| $m_1$ | [kg] | mass of carriage and lever |
| $m_2$ | [kg] | mass of mounted parts |
| $F_{a\ req.}$ | [N] | required drive power |
| $M_{d\ hor\ req.}$ | [Nm] | required drive torque in horizontal direction |
| $M_{d\ ver\ req.}$ | [Nm] | required drive torque in vertical direction |
| $L_1$ | [m] | distance of center of gravity of carriage plate and lever |
| L2 | [m] | distance of center of gravity of mounted parts and/or distance of forces F (x,y,z) |

# Linear Motion System Dimensions

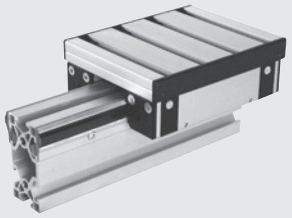



| | LIN 1501 | LIN 2001 |
|---|---|---|
| Y | 0.1 | 0.15 |



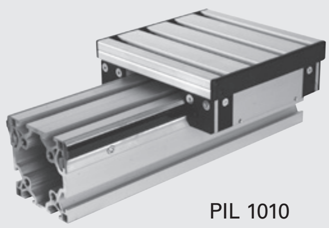

# Linear Motion System Carriage Combination Examples

PIL 2520



PIL 5010

PIL 2520

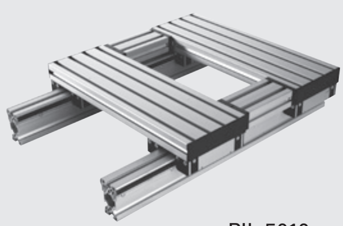


PIL 1010

PIL 2520

PIL 5020

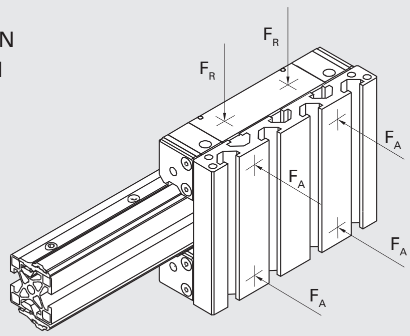
PIL 5020



PIL 5010

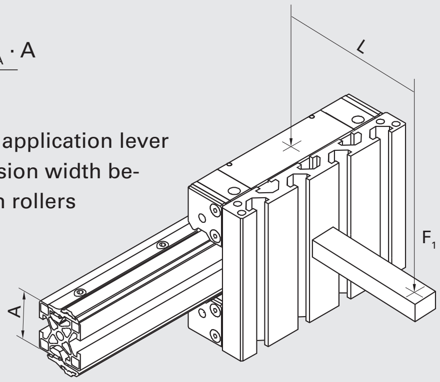
# Linear Motion System Load Capacity

$F_R < 1500$ N
$F_A < 750$ N




$$F_1 \le \frac{2 \cdot F_A \cdot A}{L}$$

L = Force application lever
A = extrusion width between rollers

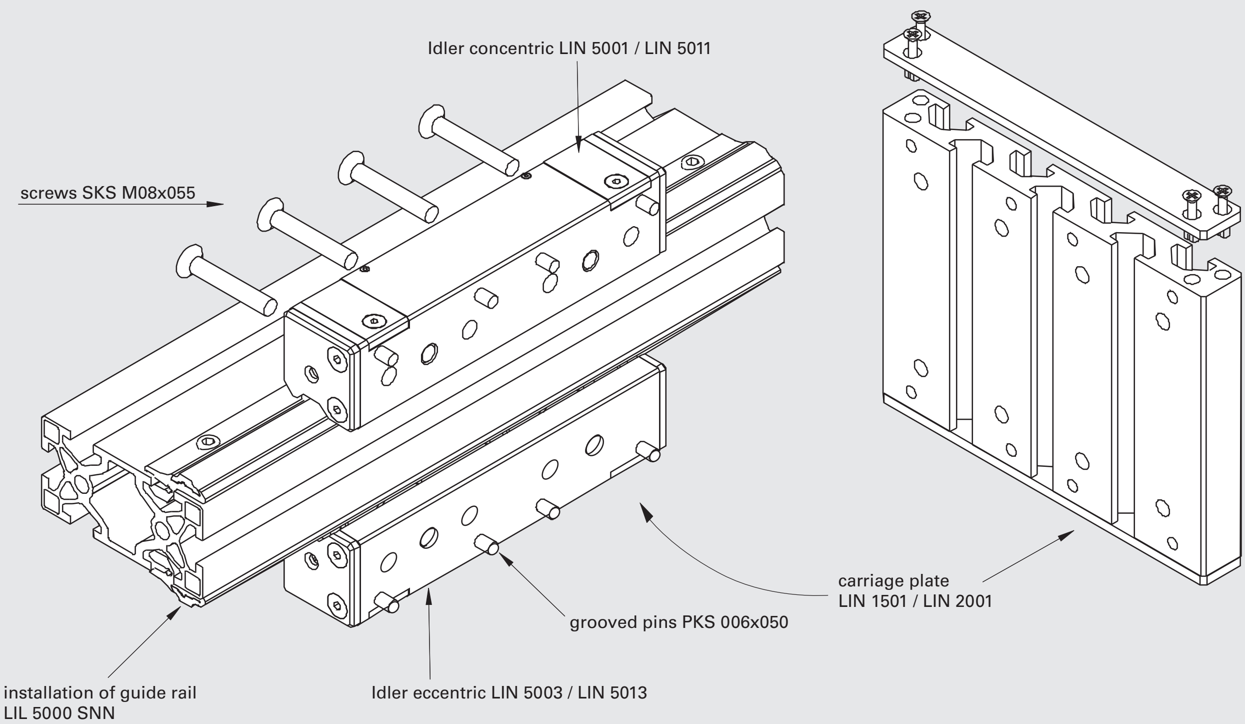


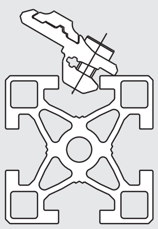

**Technical Data**
Acceleration: $a_{max.} < 15$m/s2
Max. drive torque: 60 Nm
Forces: $F_R$ [N] permissible load / roller - radial (max. 1500 N)
$F_A$ [N] permissible load / roller - axial (max. 750 N)

**Maintenance:**
Lubrication: In order to ensure maximum service life of the guiderail make sure that it is sufficiently lubricated.
Check the scraper and lubrication devices on a regular basis and re-lubricate as needed.

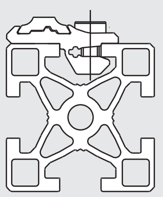
Load: Load data is valid for one type of load and one direction of load.
"Static design" refers to weight and operation forces. "Dynamic design" refers to weight and acceleration forces.

# Linear Motion System Assembly Tips



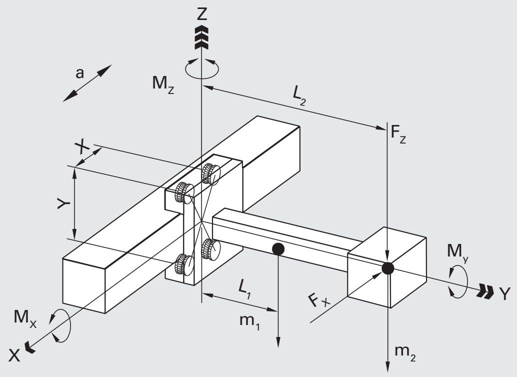
insert



press to right-hand side and tighten

# Linear Motion System Calculations

## Application A (horizontal)




**Static design:**

$$M_{X\,max.} = 2 \cdot F_A \cdot A$$

$$F_{Z\,max.} = \frac{M_{X\,max.} - g\,(m_1 \cdot L_1 + m_2 \cdot L_2)}{L_2}$$

$$M_{Z\,max.} = 2 \cdot F_A \cdot X$$

$$F_{X\,max.} = \frac{M_{Z\,max.}}{L_2}$$

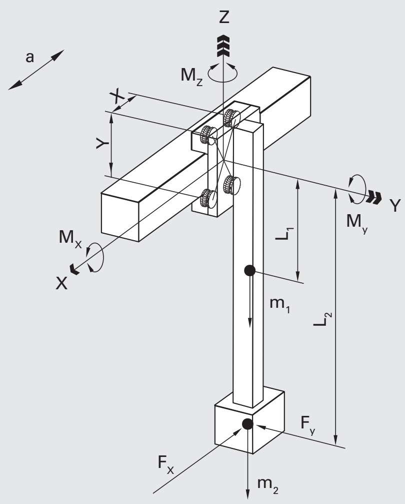
**Dynamic design:**

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

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

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

## Application B (horizontal)




**Static design:**

$$M_{X\,max.} = 2 \cdot F_A \cdot A$$

$$F_{Y\,max.} = \frac{M_{x\,max.}}{L_2}$$

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

$$F_{X\,max.} = \frac{M_{Y\,max.}}{L_2}$$

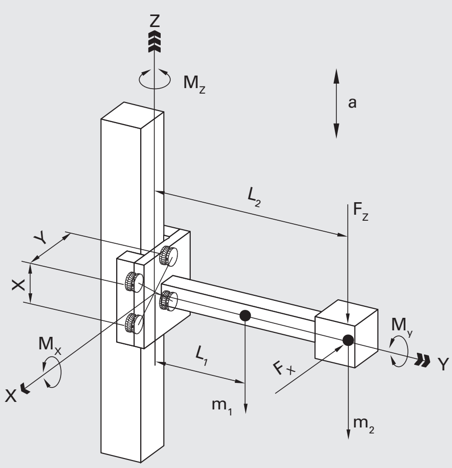
**Dynamic design:**

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

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

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

## Application C (vertical)




**Static design:**

$$M_{X\,max.} = 2 \cdot F_A \cdot X$$

$$F_{Z\,max.} = \frac{M_{x\,max.} - g \cdot (m_1 \cdot L_1 + m_2 \cdot L_2)}{L_2}$$

$$M_{Z\,max.} = 2 \cdot F_A \cdot Y$$

$$F_{X\,max.} = \frac{M_{Z\,max.}}{L_2}$$

**Dynamic design:**

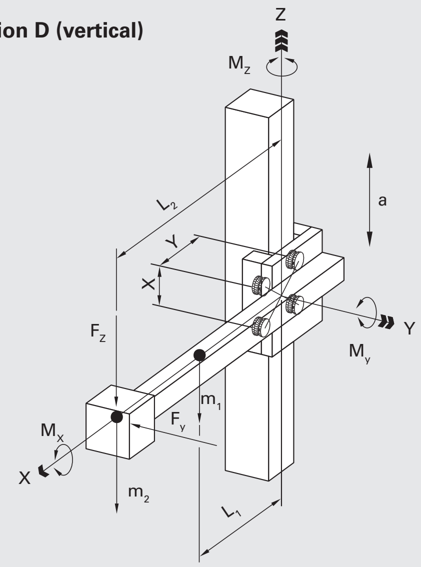
$$a_{max.} = \frac{2 \cdot F_A \cdot X}{(m_1 \cdot L_1 + m_2 \cdot L_2) \cdot 2} - g$$

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

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

# Linear Motion System Calculations

**Application D (vertical)**




Static design:

$$M_{Y\,max.} = FR * \sqrt{(x^2+y^2} - 0.036)$$

$$F_{Z\,max.} = \frac{M_{Y\,max.} - g\,(m_1 \cdot L_1 + m_2 \cdot L_2)}{L_2}$$

$$M_{Z\,max.} = 2 \cdot F_A \cdot Y$$

$$F_{Y\,max.} = \frac{M_{Z\,max.}}{L_2}$$

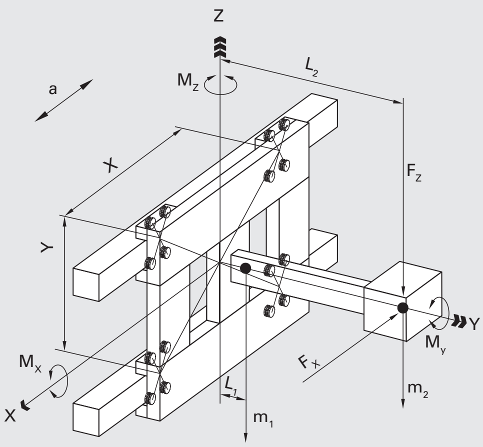
Dynamic design:

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

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

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

**Application E (horizontal)**




Static design:

$$M_{X\,max.} = 8*F_A*(y - 0.15)$$

$$F_{Z\,max.} = \frac{M_{X\,max.} - g\,(m_1 \cdot L_1 + m_2 \cdot L_2)}{L_2}$$

$$M_{Z\,max.} = 4*F_A*X$$

$$F_{X\,max.} = \frac{M_{Z\,max.}}{L_2}$$

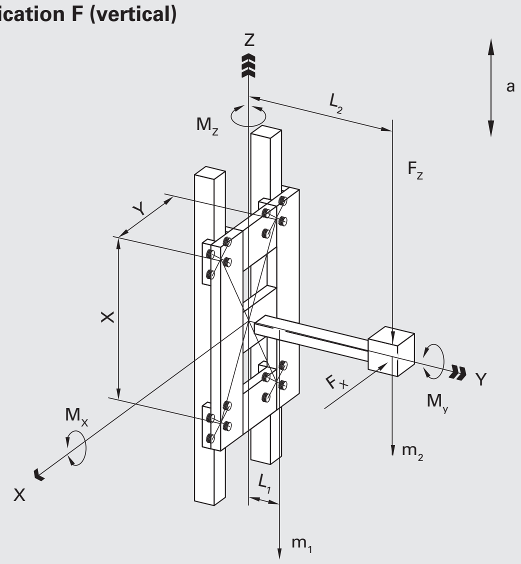
Dynamic design:

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

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

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

**Application F (vertical)**




Static design:

$$M_{X\,max.} = 4 \cdot F_A \cdot X$$

$$F_{Z\,max.} = \frac{M_{x\,max.} - g \cdot (m_1 \cdot L_1 + m_2 \cdot L_2)}{L_2}$$

$$M_{Z\,max.} = 4 \cdot F_A \cdot Y$$

$$F_{X\,max.} = \frac{M_{Z\,max.}}{L_2}$$

Dynamic design:

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

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

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