Drive selection
for linear drive units with toothed belt drive

Feed force F_x [N]

$$F_x = m \cdot g \cdot \mu$$

Acceleration force F_a [N]

$$F_a = m \cdot a$$

In vertical applications, the mass acceleration a must be added to the acceleration due to gravity g [9.81 m/s²].

Power from torque and rotational speed [kW]

$$P = \frac{M_A \cdot n_{max} \cdot 2 \cdot \pi}{60 \cdot 1000}$$

Definitions

M_A	= Required drive moment [Nm]	m	= Mass to be tranported [kg][1]
M_{load}	= Moment resulting from the various loads [Nm]	a	= Acceleration [m/s²]
M_{idle}	= Idle torque [Nm]	d_o	= Effective diam. of pulley [mm][2]
M_{rot}	= Rotational acceleration moment [Nm]	P	= Power [kW]
M_{trans}	= Translational acceleration moment [Nm]	L	= WIESEL® length [mm]
F_x	= Feed force [N]	J_{syn}	= Idle torque of pulley [kgm²]
F_a	= Acceleration force [N]	n_{max}	= Maximum rotational speed [rpm]
g	= Acceleration due to gravity [m/s²]	µ	= Friction factor
V_{max}	= Maximum linear speed [m/s]		

Calculating the drive moment M_A [Nm]

The required drive moment is composed of the "load moment", the "acceleration moment" and the "idle torque".

M_A = M_{load} + M_{trans} + M_{rot} + M_{idle}

The value for the respective idle torque can be found with the corresponding mechanical linear drive units.

$$M_{rot} = J_{syn} \cdot \frac{2 \cdot \pi \cdot n_{max}}{60} \cdot \frac{a}{V_{max}}$$

$$M_{trans} = \frac{F_a \cdot d_o}{1000 \cdot 2}$$

$$M_{load} = \frac{F_x \cdot d_o}{1000 \cdot 2}$$

M_A Total =

Type	µ	J_{syn} [kgm²]	Spec. mass tooth belt [kg/m]
WH40	0.05	8.800 E-06	0.032
WH50	0.1	1.928 E-05	0.055
WH80	0.1	2.473 E-04	0.210
WH120	0.1	1.004 E-03	0.340

Type	µ	J_{syn} [kgm²]	Spec. mass tooth belt [kg/m]
WHZ50	0.1	6.906E-05	0.055
WHZ80	0.1	5.026E-04	0.114
WM60 ZRT	0.1	2.127E-05	0.074
WM80 ZRT	0.1	1.115E-04	0.158
MLSH60 ZRT	0.1	4.604E-05	0.114

[1] Total mass m = mass to be moved + mass of power bridge [3] + mass of toothed belt

Mass of toothed belt = spec. mass of tooth belt [kg/m] · 2[4] · $\frac{\text{WIESEL®-lenght [mm]}}{1000}$

[2] Values for the respective effective diametres, see at corresponding mechanical linear units.
[3] For Z-axis moved dead mass to be taken into account.
[4] To replace by 1 at Z-Axis