Load ratings WIESEL™

Dynamic load ratings

With the help of dynamic load ratings, it is possible to calculate the approximate lifetime, dependent on load. The figures shown are for the KGT, according to DIN 69051, Part 4, Draft 1989, and for the guide, according to DIN 636.

Type	C_{KGM} P=4 [N]	C_{KGM} P=5 [N]	C_{KGM} P=10 [N]	C_{KGM} P=20 [N]	C_{KGM} P=40 [N]	C_{KGM} P=50 [N]	C_{FS} Y [N]	C_{FS} Z [N]	L_{FS} X [mm]	L_{FS} Y [mm]
WH40	–	–	–	–	–	–	(2x) 2786	(2x) 3397	72	–
WH50	–	–	–	–	–	–	–	(4x) 1270	198	39
WH80	–	–	–	–	–	–	–	(4x) 3670	220	65
WH120	–	–	–	–	–	–	–	(4x) 16200	180	97
WHZ50	–	–	–	–	–	–	–	(4x) 1270	198	39
WHZ80	–	–	–	–	–	–	–	(4x) 3670	220	65
WM40	–	2393	–	–	–	–	(2x) 2786	(2x) 3397	87	–
WM60-370 ZRT	–	–	–	–	–	–	(2x) 12964	(2x) 11934	–	35
WM60-370	–	7552	–	8312	–	4677	(2x) 12964	(2x) 11934	–	35
WM60	–	7552	–	8312	–	4677	(4x) 11495	(4x) 10581	141.7	35
WM60-500	–	7552	–	8312	–	4677	(4x) 11495	(4x) 10581	141.7	35
WM80-370 ZRT	–	–	–	–	–	–	(2x) 18723	(2x) 17919	–	49.75
WM80 ZRT	–	–	–	–	–	–	(4x) 14356	(4x) 13739	153	49.75
WM80-370	–	8804	9311	9365	–	8572	(2x) 18723	(2x) 17919	–	49.75
WM80	–	8804	9311	9365	–	8572	(4x) 14356	(4x) 13739	154	49.75
WM120	–	15429	24049	20667	8341	–	(4x) 18723	(4x) 17919	186	80.75
WV60	–	7552	–	8312	–	4677	–	–	–	–
WV80	–	8804	9311	9365	–	8572	–	–	–	–
WV120	–	15429	24049	20667	8341	–	–	–	–	–

Important note: The permissible force and moment threshold values for the respective linear unit must not be exceeded at any time.

Unit conversions

Length:	1 m=1000 mm=39.37 inches 1 inch=25.4 mm	**Geometrical moment of inertia:**	1 m^4=10^{12} mm^4=2.4025 x 10^6 in^4
Force:	1 N=0.225 lbf 1 lbf=4.45 N	**Mass moment of inertia:**	1 kg • m^2=10^4 kg • cm^2=0.738 lb • ft • s^2
Moment of Force:	1 Nm=0.738 lb • ft=8.85 lb • inches 1 lb • ft=1.36 Nm	**Mass:**	1 kg=2.2 lb

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_{load} = Moment resulting from the various loads [Nm]
M_{idle} = Idle torque [Nm]
M_{rot} = Rotational acceleration moment [Nm]
M_{trans} = Translational acceleration moment [Nm]
F_x = Feed force [N]
F_a = Acceleration force [N]
g = Acceleration due to gravity [m/s²]
V_{max} = Maximum linear speed [m/s]

m = Mass to be transported [kg][1)]
a = Acceleration [m/s²]
d_o = Effective diam. of pulley [mm][2)]
P = Power [kW]
L = WIESEL™ length [mm]
J_{syn} = Idle torque of pulley [kgm²]
n_{max} = Maximum rotational speed [rpm]
μ = Friction factor

Calculating the drive moment M_A [Nm]

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

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

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. weight 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. weight tooth belt [kg/m]
WHZ50	0.1	6.906 E-05	0.055
WHZ80	0.1	5.026 E-04	0.114

1) Total weight m = weight to be moved + weight of power bridge [3)] + weight of toothed belt
Weight of toothed belt = spec. weight of tooth belt [kg/m] · 2 [4)] · $\frac{\text{WIESEL™- length [mm]}}{1000}$

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

Drive selections

for linear drive units with ball screw 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_{load}	=	Moment resulting from the various loads [Nm]
M_{idle}	=	Idle torque [Nm]
M_{rot}	=	Rotational acceleration moment [Nm]
M_{trans}	=	Translational acceleration moment [Nm]
F_x	=	Feed force [N]
F_a	=	Acceleration force [N]
g	=	Acceleration due to gravity [m/s²]
V_{max}	=	Maximum linear speed [m/s]
m	=	Mass to be transported [kg]
a	=	Acceleration [m/s²]
p	=	Screw pitch [mm]
P	=	Power [kW]
L	=	WIESEL™ length [mm]
n_{max}	=	Maximum rotational speed [rpm]
μ	=	Friction factor
j_{sp}	=	Mass moment of inertia of the screw per meter [kgm²/m]

Calculating the drive moment M_A [Nm]

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

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

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

$$M_{rot} = \frac{j_{sp} \cdot L \cdot n_{max} \cdot a \cdot 2 \cdot \pi}{V_{max} \cdot 60 \cdot 1000}$$

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

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

M_A Total =

Friction factor μ

Values for μ	lubricated
WIESEL™ *POWERLine*® WM40	0.05
WIESEL™ *POWERLine*® WM60/80/120	0.1
WIESEL™ *DYNALine*®	Friction value of the external guide

Mass moment of inertia j_{sp}

Type	P [mm]	j_{sp} [kgm²/m]
WIESEL™ WM/WV 60	5	8.46×10^{5}
	20	8.83×10^{-5}
	50	8.45×10^{-5}
WIESEL™ *POWERLine*®/*DYNALine*® 80	5, 10, 20, 50	2.25×10^{-4}
WIESEL™ *POWERLine*®/ *DYNALine*® 120	5	6.41×10^{-4}
	10, 20, 40	6.28×10^{-4}
WIESEL™ WM40	4,5	1.13×10^{-5}