

ZAlift - 20161219 - calculation 77392021

ZIEHL-ABEGG SE
Künzelsau, Germany
773 Date: 12/11/2017

Elevator calculation acc. EN81-20/50

21

Elevator data

| | | | | |
|---------------------------|----------------|------------|-------|------------------------|
| Nominal load | Q | kg | 1600 | |
| Car weight | F | kg | 1800 | (1311 - 2788kg) |
| Counterweight | G | kg | 2600 | (50%) |
| Travelling speed | v | (V_3=) m/s | 1.00 | |
| Travel distance | H | m | 30.0 | |
| Suspension / (roping) | is | | 2 : 1 | |
| Machine at the top, above | | | | |
| Shaft efficiency | etaS | % | 82 | |
| Number of pulleys | (ball bearing) | | 3 | |
| Type of rope | WOLF PAWO F7 s | | | |
| Number of ropes | z | | 10 | |
| Rope diameter | ds | mm | 8 | |
| Rope weight | s | kg | 84 | (0.28 kg/m) |
| Compensation rope weight | su | kg | 0 | |
| Car cable weight | HK | kg | 15 | |
| Rope span weight | R | kg | 0 | |
| Min. rope breaking load | B | N | 44600 | |
| Traction sheave diameter | Dtr | mm | 320 | |
| Sheave width | | mm | 150 | (number of grooves 10) |
| Groove distance | | mm | 14.0 | Minimum distance |
| Angle of wrap minimum | min. | deg | 180 | |
| V-groove angle | | deg | 40 | |

Sheave profile: V-groove with min. 50 HRC

Traction, rope pressure, rope safety

Traction empty, on top, accelerating (1.33)
2.0283 <= 2.2857

Traction 150% nominal load, below, not moving
1.6800 <= 2.2857

Rope pressure k < permissible rope pressure
2.00 < 2.00 N/mm²

Conditions according to EN81-1 or -20:

Load 125% 1.5262 <= 2.5056 (1)

Emergency stop 1.6938 <= 2.1500 (4)

with deceleration [m/s²] 0.500

Blocked car 13.338 > 6.2782 (4)

Real safety factor > Minimum safety factor for ropes
25.48 > 12

Rope safety factor according to EN81-1 or -20:
NEQUIV = 12.0 NEQUIVT = 10.0 NEQUIVP = 02.0

Pulleys >= 320 mm, pulleys NPR = 0 NPS = 2

Rope safety nue = 25.5 > 20.0 (minSF)

Rope certification EN81

Traction conditions are fulfilled.

Rope safety conditions are fulfilled.

ZAlift - 20161219 - Machine dimensioning 77392021

Mechanical drive data

Machine manufactured by Ziehl-Abegg
 Machine type SM 210.60 Gearless synchronous
 Machine version ZAtop *

| | | |
|-------------------------|----|-------------------------|
| Traction sheave | mm | 320 /150/14.0/10x8/HK40 |
| Load output torque | Nm | 921 (max. 1000) |
| Real statical axle load | kg | 3091 (max. 4500) |

Rope pull admissible only in direction of motor foot!

Brake data

brake Mayr ROBA-twinstop 1000, 2x1200 Nm, EU-BD 1014/1
 Dual circuit disk brake, DC supply necessary
 (760 Nm, 0.86 m/s², 1 m, 11558 J, 316 W)
 2 x 1200 Nm 207 V brake, with hand release, microswitch

Machine load data in the installation

| | | |
|---|------------------------|-----------------------|
| Typical motor operating power | kW | 7.9 |
| Typ. operating current 31.2 A, Start. Current | 45.1 A at acceleration | 0.60 m/s ² |
| Start. Current | 47.4 A at acceleration | 0.7 m/s ² |
| Average power losses | 1.7 kW = | 6104.06 kJ/h |
| Output speed | rpm | 119 |
| Load torque | Nm | 921.0(eff. 628.8) |
| Inertia of installation | kgm ² | 40.54 |

240 Starts per hour , 40 % required duty cycle at elevator operation
 Max. static load pulleys 25505 N, pulley speed 1.00 m/s

Selected ZIEHL-ABEGG motor

Motor type SM210.60-20 - gearless

| | Nameplate data | (Operating data) |
|---------------------------|------------------|------------------|
| Rated voltage | V | 360 |
| Rated frequency | Hz | 20 (19.9) |
| Rated torque | Nm | 850 (921.0) |
| Rated speed | rpm | 120 (119.4) |
| Rated output power | kW | 10.7 (11.5) |
| Rated current | A | 28 (31.2) |
| Maximum torque | Nm | 1450 (1450) |
| Current at maximum torque | A | 55 (55) |
| Inertia of motor | kgm ² | 0.500 |
| Possible acceleration | m/s ² | 1.03 |

(MKmax=630.0 Nm)

Without cooling (81)

Dimension sheet A-M-6670, Motor construction type IMB3

Motor with encoder ECN 1313-2048Endat

Selected frequency inverter

Inverter ZAdyn 4CS032, Rated inverter current 32 A
 mains current 22.7 A, 400 V, 14.9 kW, Max. 1.03 m/s², F_amax 1.57 (1450 Nm)
 Radio interference filter, integrated ; Line reactor, integrated
 Brake resistance separate BR25-3 (or Recuperation: ZArec4C 026 + BR25-3)

ZAlift - 20161219 - 77392021

Elevator data

Elevator 1600kg-1.00m/s-2:1-30m
 Machine type SM 210.60
 Traction sheave 320/150/14.0/10x8/HK40
 Inertia Traction sheave 1.125 kgm²

Brake data

Mayr ROBA-twinstop 1000, 2x1200, EU-BD 1014/1, 40 ms, 95 ms, 150 ms
 2 x 1200 Nm 207 V brake, with hand release, microswitch

Calculation of unintended movement (EN81-1/A3)

Values of elevator controller

Detection distance 0.050 m
 Dead time 50 ms
 V Detector 0.000 m/s

without short-circuit motor braking

| | a [m/s ²] | s [m] | v [m/s] | t [s] |
|----|-----------------------|-------|---------|-------|
| 1: | 5.51 | 0.05 | 0.74 | 0.13 |
| 2: | 5.51 | 0.09 | 1.02 | 0.18 |
| 3: | 1.87 | 0.14 | 1.09 | 0.22 |
| 4: | 0.94 | 0.17 | 1.12 | 0.26 |
| 5: | -0.80 | 0.21 | 1.10 | 0.29 |
| 6: | -1.59 | 0.59 | 0.00 | 0.98 |

Stopping distance (without influence of traction) 0.367 m, empty up
 Max. stopping distance (depending on traction) 0.587 m, empty up
 Max. stopping distance (depending on traction) 0.380 m, full down
 Max. stopping distance (inverter off, empty car) 0.234 m, empty up
 Max. test stopping distance (v= 0.150m/s) 0.103 m, empty up
 Max. test stopping distance (v= 0.150m/s) 0.097 m, full down
 Max. test stopping distance (a= 2.000 m/s²) 0.244 m, empty up
 Max. test stopping distance (a= 2.000 m/s²) 0.219 m, full down

We assume no liability for calculation results!