

Elevator calculation acc. EN81-20/50

**Elevator data**

|  |                 |        |       |                       |
|--|-----------------|--------|-------|-----------------------|
| Nominal load                             | Q               | kg     | 450   |                       |
| Car weight                               | F               | kg     | 600   | (500 - 899kg)         |
| Counterweight                            | G               | kg     | 825   | (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 F 819 S-FE |        |       |                       |
| Number of ropes                          | z               |        | 4     |                       |
| Rope diameter                            | ds              | mm     | 8     |                       |
| Rope weight                              | s               | kg     | 25    | (0.215 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      | 30500 |                       |
| Traction sheave diameter                 | Dtr             | mm     | 320   |                       |
| Sheave width                             |                 | mm     | 74    | (number of grooves 4) |
| Groove distance                          |                 | mm     | 17.0  | Standard              |
| Angle of wrap minimum                    | min.            | deg    | 180   |                       |
| Undercutangle                            |                 | deg    | 95    |                       |
| Undercutwidth                            | b               | mm     | 5.90  |                       |
| Groove angle                             |                 | deg    | 30    |                       |
| Sheave profile: circular undercut groove |                 |        |       |                       |

**Traction, rope pressure, rope safety**

Traction empty, on top, accelerating (1.18)  
1.6785 <= 1.8399  
Traction 150% nominal load, below, not moving  
1.6080 <= 1.8399  
Rope pressure k < permissible rope pressure  
5.85 < 9.00 N/mm<sup>2</sup>

Conditions according to EN81-1 or -20:  
Load 125% 1.4716 <= 1.8582 (1)  
Emergency stop 1.5830 <= 1.6759 (4)  
with deceleration [m/s<sup>2</sup>]0.500  
Blocked car 14.714 > 3.4528 (4)

Real safety factor > Minimum safety factor for ropes  
22.58 > 12

Rope safety factor according to EN81-1 or -20:  
NEQUIV = 08.7 NEQUIVT = 06.7 NEQUIVP = 02.0  
Pulleys >= 320 mm, pulleys NPR = 0 NPS = 2  
Rope safety nue = 22.6 > 17.8 (minSF)  
Rope certification EN81

Traction conditions are fulfilled.  
 Rope safety conditions are fulfilled.  
**ZAlift - 20160710 - Machine dimensioning f8792076**

**Mechanical drive data**

Machine manufactured by Ziehl-Abegg  
 Machine type SM 200.15C Gearless synchronous  
 Machine version ZAtop \*

|                         |    |                      |
|-------------------------|----|----------------------|
| Traction sheave         | mm | 320 /74/17.0/4x8/U95 |
| Load output torque      | Nm | 263 (max. 300)       |
| Real statical axle load | kg | 970 (max. 1850)      |

**Brake data**

brake Mayr ROBA-twinstop 250, 2x280, EU-BD 845 (ABV845 + ESV845)  
 Dual circuit disk brake, DC supply necessary  
 EC type-examination, release monitoring (217 Nm, 0.39 m/s<sup>2</sup>, 2 m, 5875 J, 158 W)  
 2 x 280 Nm 207 V brake, without hand release

**Machine load data in the installation**

|  |                       |                    |
|--|-----------------------|--------------------|
| Typical motor operating power  | kW                    | 1.9                |
| Typ. operating current 14.6 A, Start. Current 22.3 A at acceleration 0.60 m/s <sup>2</sup> |                       |                    |
| Start. Current 23.6 A at acceleration 0.7 m/s <sup>2</sup>                                 |                       |                    |
| Average power losses   | 0.48 kW = 1744.2 kJ/h |                    |
| Output speed   | rpm                   | 119                |
| Load torque  | Nm                    | 263.2 (eff. 153.9) |
| Inertia of installation  | kgm <sup>2</sup>      | 12.66              |

240 Starts per hour , 40 % required duty cycle at elevator operation  
 Max. static load pulleys 8094 N, pulley speed 1.00 m/s

**Selected ZIEHL-ABEGG motor**

Motor type SM200.15C-20 - gearless

|   | Nameplate data   | (Operating   |
|---|------------------|--------------|
| data)   |                  |              |
| Rated voltage   | V                | 360          |
| Rated frequency   | Hz               | 28 ( 19.9)   |
| Rated torque  | Nm               | 250 ( 263.2) |
| Rated speed   | rpm              | 168 ( 119.4) |
| Rated output power  | kW               | 4.4 ( 3.3)   |
| Rated current   | A                | 13.5 ( 14.6) |
| Maximum torque  | Nm               | 430 ( 430 )  |
| Current at maximum torque   | A                | 28 ( 28 )    |
| Inertia of motor  | kgm <sup>2</sup> | 0.120        |
| Possible acceleration   | m/s <sup>2</sup> | 1.04         |
| (MKmax=210.0 Nm)  |                  |              |
| Without cooling (62)  |                  |              |
| Dimension sheet A-M-6445 / A-M-6451, Motor construction type IMB3 |                  |              |

Motor with encoder ECN 1313-2048Endat

### Selected frequency inverter

Inverter ZAdyn 4CS013, Rated inverter current 13 A  
mains current 8.7 A, 400 V, 5.8 kW, Max.  $0.69 \text{ m/s}^2$ ,  $F_{amax} 1.61$  (359 Nm)  
Radio interference filter, integrated ; Line reactor, integrated  
Brake resistance separate BR17-3 (or Recuperation: ZArec4C 013)  
**ZAlift - 20160710 - f8792076**

### Elevator data

|                         |                        |
|-------------------------|------------------------|
| Elevator                | 450kg-1.00m/s-2:1-30m  |
| Machine type            | SM 200.15C             |
| Traction sheave         | 320/74/17.0/4x8/U95    |
| Inertia Traction sheave | 0.520 kgm <sup>2</sup> |

### Brake data

Mayr ROBA-twinstop 250, 2x280, EU-BD 845 (ABV845 + ESV845), 35 ms, 55 ms, 95 ms  
2 x 280 Nm 207 V brake, without hand release

### 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 <sup>2</sup> ] | s [m] | v [m/s] | t [s] |  |
|----|-----------------------|-------|---------|-------|--|
| 1: | 4.34                  | 0.05  | 0.66    | 0.15  |  |
| 2: | 4.34                  | 0.09  | 0.88    | 0.20  |  |
| 3: | 1.58                  | 0.12  | 0.93    | 0.24  |  |
| 4: | 0.79                  | 0.14  | 0.95    | 0.26  |  |
| 5: | -0.41                 | 0.15  | 0.94    | 0.27  |  |
| 6: | -0.81                 | 0.70  | 0.00    | 1.43  |  |

|  |                    |
|--|--------------------|
| Stopping distance (without influence of traction)        | 0.323 m, empty up  |
| Max. stopping distance (depending on traction)           | 0.697 m, empty up  |
| Max. stopping distance (depending on traction)           | 0.425 m, full down |
| Max. stopping distance (inverter off, empty car)         | 0.256 m, empty up  |
| Max. test stopping distance (v= 0.150m/s)                | 0.103 m, empty up  |
| Max. test stopping distance (v= 0.150m/s)                | 0.096 m, full down |
| Max. test stopping distance (a= 2.000 m/s <sup>2</sup> ) | 0.312 m, empty up  |
| Max. test stopping distance (a= 2.000 m/s <sup>2</sup> ) | 0.260 m, full down |

**We assume no liability for calculation results!**