

ZAlift - 20191204 - calculation CG8892-95272

ZIEHL-ABEGG SE
Künzelsau, Germany
CG8892 Date: 22.04.2020

Elevator calculation acc. EN81-20/50

Elevator data

Nominal load	Q	kg	1275	
Car weight	F	kg	1400	(1237 - 2396kg)
Counterweight	G	kg	2038	(50%)
Travelling speed	v	(V_3=)	m/s	2,00
Travel distance	H	m	60,0	
Suspension / (roping)	is		2 : 1	
Machine at the top, above				
Shaft efficiency	etaS	%	82	
Number of pulleys	(ball bearing)		3	
Type of rope	DRAKO 250 T			
Number of ropes	z		9	
Rope diameter	ds	mm	8	
Rope weight	s	kg	147	(0,273 kg/m)
Compensation rope weight	su	kg	294	
Car cable weight	HK	kg	15	
Rope span weight	R	kg	0	
Min. rope breaking load	B	N	43300	
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	
Undercutangle		deg	100	
Undercutwidth	b	mm	6,13	
Groove angle		deg	30	
Sheave profile: circular undercut groove				

Traction, rope pressure, rope safety

Traction empty, on top, accelerating
 $1,7447 \leq 1,9023$
Traction 150% nominal load, below, not moving
 $1,5464 \leq 1,9023$
Rope pressure $k <$ permissible rope pressure
 $7,94 < 9,00 \text{ N/mm}^2$

Conditions according to EN81:

Load 125% $1,4161 \leq 1,9110$ (2)
Emergency stop $1,5635 \leq 1,5882$ (2)
with deceleration $[m/s^2] 0,571$
Blocked car $07,159 > 3,6518$ (4)

Real safety factor $>$ Minimum safety factor for ropes

$26,62 > 12$

Rope safety factor according to EN81:

Pulleys $\geq 320 \text{ mm}$, pulleys NPR = 0 NPS = 2
Rope safety $nue = 26,6 > 20,0$ (minSF)
Rope certification EN81

Traction conditions are fulfilled.
Rope safety conditions are fulfilled.

ZAlift - 20191204 - Machine dimensioning CG8892-95272**Mechanical drive data**

Machine manufactured by Ziehl-Abegg

Machine type **SM 210.60B** Gearless synchronous

Machine version ZAtop *

Traction sheave mm **320 /150/14,0/10x8/U100**

Load output torque Nm 620 (max. 1000)

Real statical axle load kg 2658 (max. 4500)

Rope pull admissible only in direction of motor foot!

Brake data

brake Mayr ROBA-twinstop 1000, 2x1200 Nm, EU-BD 1014

Dual circuit disk brake, DC supply necessary

(512 Nm, 1,52 m/s², 2 m, 26168 J, 316 W)

207 V brake, with hand release, microswitch

Machine load data in the installation

Typical motor operating power kW 12,1

Typ. operating current 41,9 A, Start. Current 73,4 A at acceleration 0,90 m/s²Start. Current 77,2 A at acceleration 1 m/s²Start. Current 65,7 A at acceleration 0,7 m/s²

Average power losses 2,28 kW = 8222,32 kJ/h

Output speed rpm 239

Load torque Nm 620,3 (eff. 483,5)

Inertia of installation kgm² 35,82240 Starts per hour, **60 % required duty cycle at elevator operation**

Max. static load pulleys 22884 N, pulley speed 2,00 m/s

Selected ZIEHL-ABEGG motor

Motor type SM210.60B-20 - gearless

	Nameplate data	(Operating data)
Rated voltage	V 360	
Rated frequency	Hz 43	(39,8)
Rated torque	Nm 800	(620,3)
Rated speed	rpm 258	(238,8)
Rated output power	kW 21,6	(15,5)
Rated current	A 54	(41,9)
Maximum torque	Nm 1450	(1450)
Current at maximum torque	A 109	(109)
Inertia of motor	kgm ² 0,500	
Possible acceleration	m/s ² 1,83	

Cooling FB020-4EW.W6.A5 (1~230V_30W) (48)

Dimension sheet A-M-6706, Motor construction type IMB3

Motor with encoder ECN 1313-2048Endat

Selected frequency inverter

Inverter ZAdyn 4CS050, Rated inverter current 50 A

mains current 26,7 A, 400 V, 17,6 kW, Max. 1,33 m/s², F_amax 2,15 (1197 Nm)

Radio interference filter, integrated ; Line reactor, integrated

Brake resistance separate BR50-3 (or Recuperation: ZAreC4C 026 + BR17-3)

Brake control module ohne

ZAlift - 20191204 - Energy calculation**Elevator data**

Elevator		1275kg-2,00m/s-2:1-60m
Total trips per day		1440,00
Energy cost	ct/kWh	26,00
Average load of machine, typical 70-90%	%	80,00
Travel demand	W	350,00
Contactor to switch off inverter and recuperation:		No
Inverter and recuperation with standby-function:		Yes
Standby demand	W	40,00
Standby demand inverter	W	21,00
Standby demand regeneration	W	11,00
Power for brake release	W	316,00

Calculation according VDI4707

Usage category		5 (6.0h VDI 4707)
Selected ZIEHL-ABEGG motor		SM210.60B-20-21kW-800Nm-239rpm
Load power	W	12141,86
Power consumption	W	13554,77
Load factor		0,70
Counterweight balance factor		0,50

without recuperation

Travel Energy cost per year	Euro	3746,54
Standby Energy cost per year	Euro	104,20
Total Energy cost per year	Euro	3850,74
Nominal demand per year	kWh	14811
Energy consumption reference trip	Wh	156,66
Specific travel demand	mWh/kg/m	0,717
Total specific energy demand	mWh/kg/m	0,737
Energy efficiency class Travel		B
Energy efficiency class Standby		B
Energy efficiency class Total		B

with recuperation**ZArec4C 026 + BR17-3**

Regeneration power	W	9038,27
max recuperation power	W	20259,36
max recuperation current	A	32,49
Travel Energy cost per year	Euro	1939,89
Standby Energy cost per year	Euro	122,99
Total Energy cost per year	Euro	2062,88
Nominal demand per year	kWh	7934
Energy consumption reference trip	Wh	81,12
Specific travel demand	mWh/kg/m	0,371
Total specific energy demand	mWh/kg/m	0,395
Energy efficiency class Travel		A
Energy efficiency class Standby		B
Energy efficiency class Total		A

All data subject to measuring on site!

ZAlift - 20191204 - CG8892-95272**Elevator data**

Elevator	1275kg-2,00m/s-2:1-60m
Machine type	SM 210.60B
Traction sheave	320/150/14,0/10x8/U100
Inertia Traction sheave	1,125 kgm ²

Brake data

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

Calculation of unintended movement**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:	4,64	0,05	0,68	0,15
2:	4,64	0,09	0,91	0,20
3:	1,37	0,13	0,97	0,24
4:	0,68	0,15	0,98	0,26
5:	-0,54	0,17	0,97	0,28
6:	-1,08	0,61	0,00	1,18

Stopping distance (without influence of traction)	0,281 m, empty up
Max. stopping distance (depending on traction)	0,605 m, empty up
Max. stopping distance (depending on traction)	0,388 m, full down
Max. stopping distance (inverter off, empty car)	0,205 m, empty up
Max. test stopping distance (v= 0,150m/s)	0,099 m, empty up
Max. test stopping distance (v= 0,150m/s)	0,094 m, full down
Max. test stopping distance (a= 2,000 m/s ²)	0,270 m, empty up
Max. test stopping distance (a= 2,000 m/s ²)	0,235 m, full down

We assume no liability for calculation results!