

Elevator calculation acc. EN81-20/50

Elevator data

Nominal load	Q	kg	1000	
Car weight	F	kg	1100	(810 - 2144kg)
Counterweight	G	kg	1600	(50%)
Travelling speed	v (V_3=)	m/s	2,00	
Travel distance	H	m	85,0	
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		8	
Rope diameter	ds	mm	8	
Rope weight	s	kg	185	(0,273 kg/m)
Compensation rope weight	su	kg	371	
Car cable weight	HK	kg	22	
Rope span weight	R	kg	0	
Min. rope breaking load	B	N	43300	
Traction sheave diameter	Dtr	mm	320	
Sheave width		mm	122	(number of grooves 8)
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
 $1,6871 \leq 1,9023$
 Traction 150% nominal load, below, not moving
 $1,5073 \leq 1,9023$
 Rope pressure k < permissible rope pressure
 $7,47 < 9,00 \text{ N/mm}^2$

Conditions according to EN81:
 Load 125% $1,3921 \leq 1,9110$ (2)
 Emergency stop $1,5294 \leq 1,5882$ (2)
 with deceleration $[m/s^2] 0,571$
 Blocked car $04,968 > 3,6518$ (4)

Real safety factor > Minimum safety factor for ropes
 $28,31 > 12$
 Rope safety factor according to EN81:
 $NEQUIV = 12,0$ $NEQUIVT = 10,0$ $NEQUIVP = 02,0$
 Pulleys $\geq 320 \text{ mm}$, pulleys NPR = 0 NPS = 2
 Rope safety $nue = 28,3 > 20,0$ (minSF)
 Rope certification EN81

Traction conditions are fulfilled.
 Rope safety conditions are fulfilled.

ZAlift - 20181002 - Machine dimensioning CG8892-95062

Mechanical drive data

Machine manufactured by Ziehl-Abegg

Machine type SM 200.40D Gearless synchronous

Machine version ZAtop *

Traction sheave mm 320 /122/14,0/8x8/U100

Load output torque Nm 497 (max. 660)

Real statical axle load kg 2232 (max. 3600)

Brake data

brake Warner ERS VAR07 SZ800/800, 2x800 Nm, EU-BD 819/2

Dual circuit disk brake, DC supply necessary

(410 Nm, 1,00 m/s², 3 m, 26401 J, 264 W)

207 V brake, with hand release, microswitch

Machine load data in the installation

Typical motor operating power kW 9,2

Typ. operating current 31,9 A, Start. Current 57,6 A at acceleration 0,83 m/s²

Start. Current 53,1 A at acceleration 0,7 m/s²

Average power losses 1,83 kW = 6594,28 kJ/h

Output speed rpm 239

Load torque Nm 497,5 (eff. 368,4)

Inertia of installation kgm² 30,80

240 Starts per hour, 50 % required duty cycle at elevator operation

Max. static load pulleys 19338 N, pulley speed 2,00 m/s

Selected ZIEHL-ABEGG motor

Motor type SM200.40D-20 - gearless

	Nameplate data	(Operating data)
Rated voltage	V 360	
Rated frequency	Hz 43	(39,8)
Rated torque	Nm 600	(497,5)
Rated speed	rpm 258	(238,8)
Rated output power	kW 16,2	(12,4)
Rated current	A 38,5	(31,9)
Maximum torque	Nm 1000	(1000)
Current at maximum torque	A 73	(73)
Inertia of motor	kgm ² 0,310	
Possible acceleration	m/s ² 1,29	

(MKmax=400,0 Nm)

Without cooling (69)

Dimension sheet A-M-6665, Motor construction type IMB3

Motor with encoder ECN 1313-2048Endat

Selected frequency inverter

Inverter ZAdyn 4CS032, Rated inverter current 32 A

mains current 22,2 A, 400 V, 14,6 kW, Max. 0,83 m/s², F_{amax} 1,80 (789 Nm)

Radio interference filter, integrated ; Line reactor, integrated

Brake resistance separate BR50-3 Attention! (or Recuperation: ZRec4C 039 + BR14A)

ZAlift - 20181002 - Energy calculation

Elevator data

Elevator		1000kg-2,00m/s-2:1-85m
Total trips per day		508,00
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	19,00
Standby demand regeneration	W	11,00
Power for brake release	W	264,00

Calculation according VDI4707

Usage category		4 (3.0h VDI 4707)
Selected ZIEHL-ABEGG motor		SM200.40D-20-16kW-600Nm-239rpm
Load power	W	9515,57
Power consumption	W	10888,46
Load factor		0,70
Counterweight balance factor		0,50

without recuperation

Travel Energy cost per year	Euro	1528,11
Standby Energy cost per year	Euro	117,58
Total Energy cost per year	Euro	1645,69
Nominal demand per year	kWh	6330
Energy consumption reference trip	Wh	181,04
Specific travel demand	mWh/kg/m	0,745
Total specific energy demand	mWh/kg/m	0,803
Energy efficiency class Travel		B
Energy efficiency class Standby		B
Energy efficiency class Total		B

with recuperation

ZArec4C 039 + BR14A

Regeneration power	W	6920,24
max recuperation power	W	15646,97
max recuperation current	A	25,09
Travel Energy cost per year	Euro	845,56
Standby Energy cost per year	Euro	139,50
Total Energy cost per year	Euro	985,07
Nominal demand per year	kWh	3789
Energy consumption reference trip	Wh	100,18
Specific travel demand	mWh/kg/m	0,413
Total specific energy demand	mWh/kg/m	0,481
Energy efficiency class Travel		A
Energy efficiency class Standby		B
Energy efficiency class Total		A

All data subject to measuring on site!

ZAlift - 20181002 - CG8892-95062

Elevator data

Elevator 1000kg-2,00m/s-2:1-85m
Machine type SM 200.40D
Traction sheave 320/122/14,0/8x8/U100
Inertia Traction sheave 0,843 kgm²

Brake data

Warner ERS VAR07 SZ800/800, 2x800, EU-BD 819/2, 40 ms, 65 ms, 90 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:	3,70	0,05	0,61	0,16
2:	3,70	0,09	0,79	0,21
3:	1,23	0,12	0,84	0,25
4:	0,61	0,13	0,85	0,27
5:	-0,64	0,14	0,84	0,28
6:	-1,27	0,42	0,00	0,94

Stopping distance (without influence of traction) 0,239 m, empty up
Max. stopping distance (depending on traction) 0,417 m, empty up
Max. stopping distance (depending on traction) 0,301 m, full down
Max. stopping distance (inverter off, empty car) 0,171 m, empty up
Max. test stopping distance (v= 0,150m/s) 0,091 m, empty up
Max. test stopping distance (v= 0,150m/s) 0,087 m, full down
Max. test stopping distance (a= 2,000 m/s²) 0,240 m, empty up
Max. test stopping distance (a= 2,000 m/s²) 0,217 m, full down

We assume no liability for calculation results!