ZIEHL-ABEGG

Die Königsklasse

The Royal League

Die Königsklasse in Lufttechnik, Regeltechnik und **Antriebstechnik** | The Royal League in ventilation, control and **drive technology**

ZA top SM250.60B

Gearless permanent magnet synchronous motor

Original operating instructions

Store for future use!

Content

1 General information

Compliance with the following instructions is mandatory to ensure the functionality and safety of the product. If the following instructions given especially but not limited for general safety, transport, storage, mounting, operating conditions, start-up, maintenance, repair, cleaning and disposal / recycling are not observed, the product may not operate safely and may cause a hazard to the life and limb of users and third parties.
Deviations from the following requirements may therefore lead both to the loss of the statutory material defect liability rights and to the liability of the buyer for the product that has become unsafe due to the deviation from the specifications.

1.1 Structure of the operating instructions

These operating instructions help you to work safely on and with the elevator machine ZAtop SM250.60B. They contain safety instructions that must be complied with as well as information that is required for failure-free operation of the elevator machine.
The operating instructions must be stored in the vicinity of the elevator machine. It must be ensured that all persons who have to perform activities on the elevator machine can consult the operating instructions at any time. Instructions for use in accordance with the German Occupational Safety and Health Act and the German Work Equipment Ordinance must be provided in addition to these operating instructions.
Keep the operating instructions for continued use. They must be passed-on to all successive owners, users and final customers.

1.2 Target group

The operating instructions address persons entrusted with planning, installation, start-up, maintenance and servicing, who have the corresponding qualifications and skills for their job.

1.3 Exclusion of liability

ZIEHL-ABEGG SE is not liable for damage due to misuse, incorrect use, improper use or as a consequence of unauthorized repairs or modifications.

1.4 Copyright

2 Safety instructions

2.1 General

The ZIEHL-ABEGG SE elevator machine is not a ready-to-use product and may only be operated after having been installed in machines or plants and its safety, depending on the application, has been ensured by protective grille, barriers, constructive devices or other adequate measures (see DIN EN ISO 13857)!
Installation, connection to the power supply and commissioning may only be performed by qualified service personnel! The relevant regulations must be observed!
Planners, manufacturers and operators of system parts or entire systems are responsible for the correct and safe mounting and a reliable operation.

2.2 Intended use

The ZAtop SM250.60B is a permanent-magnet, gearless elevator machine, designed as an internal rotor motor for elevator with and without a machine room. The elevator machine is not designed for any use other than those listed here – this is considered improper use.
Applications other than the intended use of this elevator machine are not permitted without approval by ZIEHL-ABEGG SE.
Reading these operating instructions and complying with all instructions - especially the safety instructions - they contain is considered part of intended use. It also includes carrying out all the inspection work at the prescribed intervals.
Not the manufacturer, rather the operator of the ZAtop SM250.60B is liable for any personal harm or material damage arising from non-intended use!

2.3 Pictographs

Safety instructions are highlighted with warning triangles and are depicted according to the degree of hazard as follows.

	**Danger!** General hazardous area. Death or severe injury or significant property damage can occur if the corresponding precautions are not taken!
	**Attention!** Risk of moderate or minor injury if the corresponding precautions are not taken!
CAUTION!	**Attention!** Material damage is possible if the corresponding precautions are not taken.

	**Danger!** Danger by dangerous, electric voltage! Death or severe injury can occur if the corresponding precautions are not taken!
	**Information** Important additional information and advice for user.
	**Attention!** Danger by hot surface! Slight bodily harm is possible if the corresponding precautions are not taken!

2.4 Product safety

The elevator machine conforms to the state of the art at the time of delivery and is fundamentally considered to be reliable. The elevator machine and accessories may only be installed and operated in perfect condition and in compliance with the operating instructions.
Exceeding the limits stated in the chapter “Enclosure / technical data” can lead to a defect in the elevator machine.

2.5 Requirements placed on the personnel / due diligence

Persons entrusted with the planning, installation, commissioning and maintenance and servicing in connection with the elevator machine must have the corresponding qualifications and skills for these jobs. Based on their training, knowledge and experience as well as knowledge of the relevant standards, they must be able to judge the work transferred to them and be able to recognize possible hazards.
In addition, they must be knowledgeable about the safety regulations, EU directives, rules for the prevention of accidents and the corresponding national as well as regional and in-house regulations.
Personnel undergoing training, instruction, or on apprenticeship may only work on the elevator machine under the supervision of an experienced person. This also applies to personnel in general training.
Comply with the legal minimum age.

2.6 General safety instructions

Danger!
▷ Rotation of the drive shaft induces a voltage, which is applied to the connection terminals.

Danger!
▷ The elevator machine has attachment points: integrally cast eyelets or screwed-on eye bolts, eye plates or steel cable loops. The attachment points are designed exclusively for transporting the elevator machine including brake and traction sheave. Do not lift other loads such as bolted on components, ropes lying on top, etc. with the attachment points. Suitable lifting gear must be used.

Attention!
▷ Depending on the operating conditions, the elevator machine can have high surface temperatures of > 80°C.
Risk of burns!
If the installation situation does not provide sufficient personal protection, then this must be provided by the customer in the form of additional measures.
If work has to be carried out on the machine at normal operating temperature, suitable gloves must be worn.

Attention!
Warning of hand injuries!

▷ Risk of injury from reaching into the rope guard.
▷ Do not carry out any activities during operation.
▷ Only perform maintenance work on the drive when stopped.

▷ The elevator machine is only to be operated within the ranges dened on the name plate of the motor!

▷ Use the elevator machine only in the authorised fashion and only for the tasks and flow media specified in the order!

▷ If the elevator machine is not energised, no electric torque is available. Releasing the brakes can cause uncontrolled acceleration of the elevator.
We recommend short-circuiting the windings of the de-energised elevator machine to generate a brake torque dependent on the speed.
In the event of a short-circuit, a short-circuit current of at least the level of the rated current is flowing.
The windings may not be short-circuited when the elevator machine is energised.

▷ Safety features, for example the brake release monitoring, may not be dismantled, circumvented or made inoperative!

▷ Thermistor installed in the winding act as protection against excess temperatures in the elevator machine and must be evaluated. When the thermistor are activated, the energy supply to the elevator machine must be switched off.

2.7 Operator’s obligation of diligence

The elevator machine has been designed and built after consideration of a risk analysis and after careful selection of the harmonised standards to be complied with as well as other technical specifications. It therefore complies with the state of the art and guarantees maximum safety during operation. However, this safety can only be achieved in practical operation when all the necessary measures are taken. The machine operator therefore has a duty of care to ensure that these measures are planned and to supervise their execution.

In particular, the operator must ensure that

- ▷ the elevator machine is used as intended (see chapter “Product overview”)
- ▷ the installation is operated in a flawless, functional condition and the safety devices are periodically checked for their properly functioning condition
- ▷ The required personal safety gear is available to and used by the operating, maintenance and repair personnel
- ▷ the operating instructions are available at the location where the elevator machine is being used, are complete and are in legible condition
- ▷ sufficiently qualified and authorized personnel operate, maintain and repair the elevator machine
- ▷ these personnel receive regular instruction in all relevant industrial safety and environmental protection issues and are familiar with the operating instructions and the safety instructions they contain
- ▷ all safety and warning notices attached to the elevator machine are never removed and remain legible

2.8 Employment of external personnel

Maintenance and service work are frequently carried out by external employees who often do not recognize the specific situations and the thus resulting dangers.
These persons must be comprehensively informed about the hazards in their area of activity.
You must monitor their working methods in order to intervene in good time if necessary.

3 Product overview

3.1 Operational area

The ZAtop SM250.60B is designed as a gearless elevator machine for traction sheave rope elevators.
Owing to its very compact design, the ZAtop SM250.60B is ideal for machine roomless elevators.
The type-tested brake can be used as a:

- Brake mechanism acting on the drive shaft as part of the ascending car overspeed protection means
- Brake element acting on the drive shaft as part of the protection against unintended car movement

3.2 Name plate

The name plate for the ZAtop SM250.60B drives specify two values as nominal values for maximum / average nominal power, maximum / average nominal current, maximum / average nominal torque and on time at maximum / average load.
The first values in each case represent the maximum load for operation of the elevator (descending with empty car or ascending with full car). The second values stand for the average load for operation of the elevator.

The name plate is on the brake-side on the left and right on the housing of the ZAtop SM250.60B.

Figure 3-2-01
Example name plate ZAtop SM250.60B

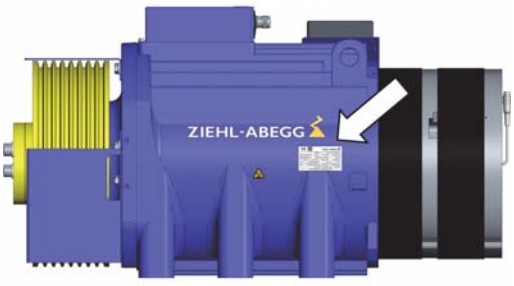


Figure 3-2-02
Position of the name plate

no.	Designation		no.	Designation	
1	CE mark		13	T_r - Rated torque	[Nm]
2	S/N - Motor number		14	I_{max} - Acceleration current	[A]
3	Type - Motor type and size		15	I_r - Rated current	[A]
4	Network form / Connection type / Rated voltage	[V]	16	n - Rated speed	[rpm]
5	cos ϕ - Power factor		17	P_r - Rated power	[kW]
6	J_M - Moment of inertia	[kg m^2]	18	Specification of relevant standard	
7	Mode		19	Protection rating	
8	Duty - On time	[%]	20	Insulation class	
9	Mass - Weight	[kg]	21	U_G - Generator voltage	
10	R_{U20} - Winding resistance	[Ω]	22	Rated frequency	[Hz]
11	Trips per hour	[st/h]	23	Series	
12	T_{max} - Acceleration torque	[Nm]	24	QR code	

Table 3-2

Values for maximum load for operation of elevator (trip with full cabin down and with full cabin up):
1600 Nm; 15 % on time; 16,0 kW; 43 A

Values for average load for operation of elevator:
950 Nm; 40 % on time; 9,6 kW; 26 A

Note:
The first rated currrent is the decisive factor in the selection of both the frequency inverter and the line cross section of the motor cable.

3.3 Transport

- ZIEHL-ABEGG SE elevator machine are packed by the manufacturer for the types of transport and storage agreed upon.

▷ Check packing and elevator machine for possible damage and report the forwarding agency about any damages caused by transport. Shipping damages are not covered by our guarantee!
▷ Avoid excessive vibration and shockloads!
▷ Extreme heat or cold (transport temperature -20 °C to +60 °C) must be avoided!

3.3.1 Transport

▷ Transport the elevator machine in the original packing.

3.3.2 Lifting

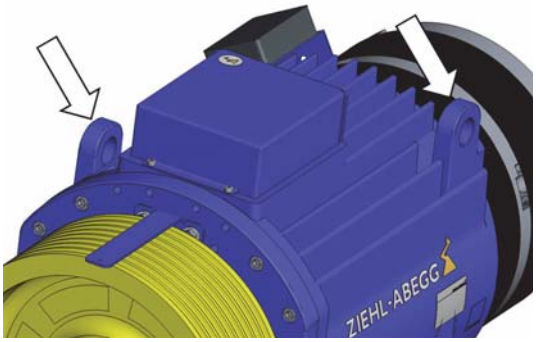


Figure 3-3-2-01 - Position of attachment points

Lift the elevator machine:
▷ Only at the designated attachment points (see Figure 3-3-2-01).
▷ At all attachment points at the same time.
▷ Using suitable lifting gear.
▷ Correctly taking into account the centre of gravity.
▷ Without additional loads.
▷ Do not lift at the end face in the shaft ends.

3.4 Storage

▷ Store the elevator machine in the original packaging in a dry area protected from the weather or protect it from dirt and weather until final mounting.
▷ Extreme heat or cold (storage temperature -20 °C to +60 °C) must be avoided!
▷ High humidity which can lead to condensation must be avoided.
▷ Avoid aggressive conditions (for example salt spray)!
▷ Avoid excessive storage times (we recommend max. one year) and check bearing for correct function before installing the motor. (Release the brakes and move the rotor by hand. Take care if the bearing makes untypical noises)

3.5 Disposal / recycling

Disposal must be carried out professionally and environmentally friendly in accordance with the legal stipulations.

4 Mechanical installation

4.1 General mounting advises

Mounting, electrical connection and commissioning are only to be performed by trained service personnel. Adhere to all machinery-related requirements and specifications supplied by the system manufacturer or machine builder.

CAUTION!

Attention!
▷ Cover the elevator machine and particularly the brakes appropriately when carrying out any work in or on the elevator that results in dust or chips!
▷ Do not install distorted.
▷ Do not apply any force (levering, bending). Above all, do not expose the rotor to any heavy mechanical shocks.
▷ Before assembly, the elevator machine must be checked for transport damage, particularly the cables.
▷ No welding work may be carried out on the elevator machine. The elevator machine may not be used as a grounding point for welding work. Magnets and bearings can be destroyed!
▷ The cooling air flow around the elevator machine must not be obstructed.
▷ We rcommend keep at least 300 mm space between the brake and the wall (axial direction) to make access to the encoder possible.
▷
The brake design with manual hand release must be freely accessible since the levers for brake release are moved laterally (see chapter “Start-up / manual emergency evacuation)”!

4.2 Fastening the elevator machine

▷ On the bottom side of the socket are 6 threads.
▷ The elevator machine has to be fixed with 4 screws M30 - 8.8 at the mounting plate.
Tightening torque M30 - 8.8: 1350 Nm
▷ Screw-in depth at least 1.5 times of screw size (minimum 45 mm, maximum 55 mm).
▷ Fasten the screws crosswise in at least two steps to the required tightening torque.
▷ The permissible unevenness for the mounting surface is 0.3 mm.
▷ The mounting surface has to be rigid and robust enough to withstand the forces.
▷ For the vibration decoupling of the elevator system, damping elements should be used.

4.3 Fitting the ropes

Figure 4-3-01 - Fitting the ropes

▷ If the traction sheave should offer more grooves than the actual number of ropes, the ropes must be applied on the sheave either centred or towards the motor side.

4.4 Rope pull

With side interlocking support, rope pull may be carried out in all directions.
Without side interlocking support, rope pull may only be carried out in vertical direction.
The rope force direction resulting from rope pull must be observed.

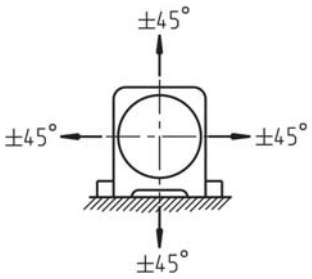


Figure 4-4-01 - Resulting rope force with lateral form lock support

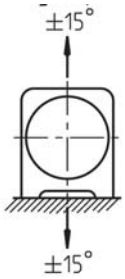


Figure 4-4-02 - Resulting rope force without lateral form lock support

4.5 Fastening rope guard

Attention!
Warning of hand injuries!

▷ Risk of injury from reaching into the rope guard.
▷ Do not carry out any activities during operation.
▷ Only perform maintenance work on the drive when stopped.

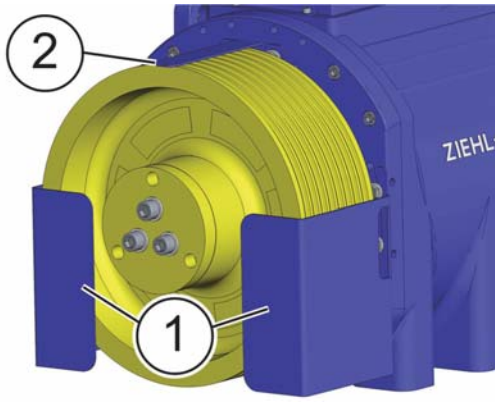


Figure 4-5-01 - Rope guard

▷ The elevator machine is on the right and left fitted with rope guard (1).
▷ A 3rd rope retainer (2) is optionally available.
▷ Set the rope guard to a distance of 2 - 3 mm from the ropes.

Rope guard adjustability
Depending on the rope guard design, the rope departure can be adjusted differently:

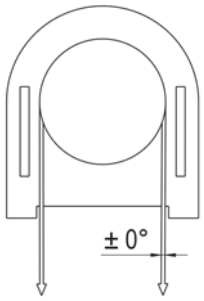


Figure 4-5-02 - For wrap angle 180°.

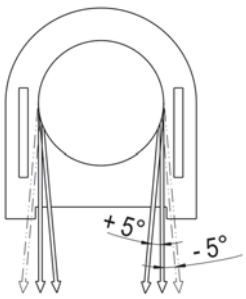


Figure 4-5-03 - Adjustability on both sides ± 5°.
Normal wrap angles 175° - 185°.

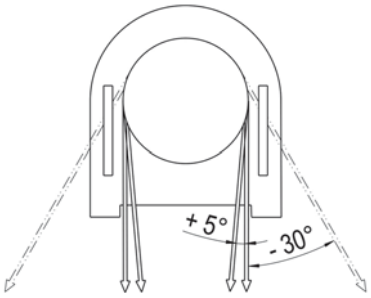


Figure 4-5-04 - Adjustability on both sides + 5°/- 30°.
Normal wrap angles 150° - 185°.

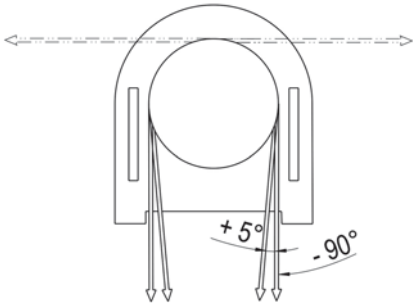


Figure 4-5-05 - Adjustability on both sides + 5°/- 90°.
Normal wrap angles 90° - 185°.

4.5.1 Rope guard fastening in the case of a traction sheave diameter of 320 mm

Adjustability on both sides + 5°/- 30°. Normal wrap angles 30° - 185°.

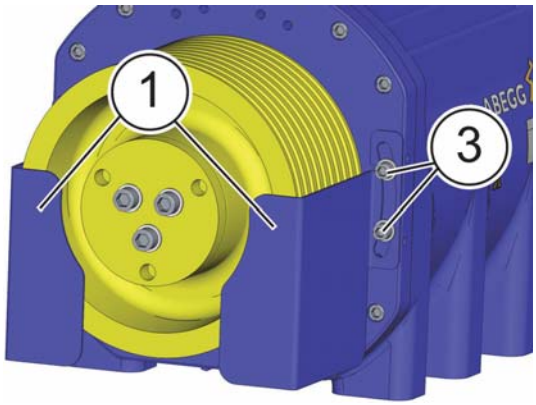


Figure 4-5-1-01 - Rope guard traction sheave 300

▷ The rope guard (1) is attached to the housing with two socket cap screws M12 x 25 - 8.8 (4) and washers.
▷ The elongated holes in the rope guard (1) enables the required distance to the ropes to be set at the socket cap screws M12 x 25 - 8.8 (2).
Tightening torque M12 - 8.8: 79 Nm
▷ Set the rope guard to a distance of 2 - 3 mm from the ropes.

4.5.2 Rope guard fastening in the case of a traction sheave diameter of 400 mm and a traction sheave width of 150 mm

Adjustability on both sides + 5°/- 30°. Normal wrap angles 30° - 185°.

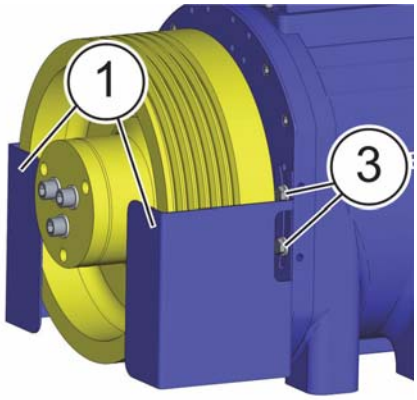


Figure 4-5-2-01 - Rope guard traction sheave 400 x 150

▷ The rope guard (1) is attached to the housing with two hexagon head bolts M12 x 25 - 8.8 (3) and washers.
▷ The elongated holes in the rope guard (1) enables the required distance to the ropes to be set at the hexagon head bolts M12 x 25 - 8.8 (2).
Tightening torque M12 - 8.8: 79 Nm
▷ Set the rope guard to a distance of 2 - 3 mm from the ropes.

4.5.3 Rope guard fastening in the case of a traction sheave diameter of 400 mm and a traction sheave width of 186 mm

Adjustability on both sides + 5°/- 30°. Normal wrap angles 30° - 185°.

Figure 4-5-3-01 - Rope guard traction sheave 400 x 186

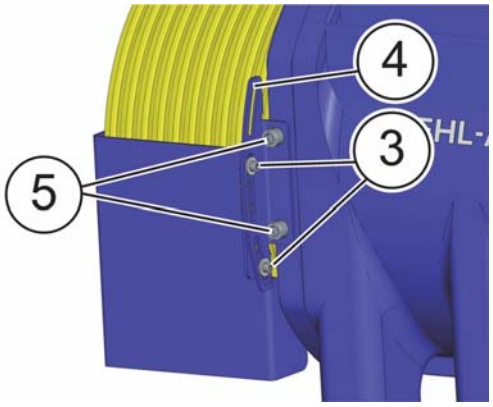


Figure 4-5-3-02 - Setting rope guard

▷ The rope guard (1) is attached to the bracket (4) with two socket cap screws M6 x 12 - 8.8 (3) and washers.
▷ The slotted holes in the bracket (4) enable the required distance to the cables to be set at the socket cap screws M6 x 12 - 8.8 (2).
Tightening torque M6 - 8.8: 9.5 Nm
▷ Set the rope guard to a distance of 2 - 3 mm from the ropes.
▷ The bracket (4) is attached with two socket cap screws M12 x 25 - 8.8 (5) and washers to the housing.
Tightening torque M12 - 8.8: 79 Nm

4.5.4 Rope guard fastening in the case of a traction sheave diameter of 400 mm and a traction sheave width of 186 mm - not adjustable

For wrap angle 180°.

Figure 4-5-4-01 - Rope guard traction sheave 400 x 186

▷ The rope guard (1) is attached to the housing with two hexagon head bolts M12 x 25 - 8.8 (3) and washers.
Tightening torque M12 - 8.8: 79 Nm
▷ The rope guard (1) can not adjusted.

4.5.5 Rope guard fastening for traction sheave diameter 400 mm and traction sheave width 186 mm - not adjustable - lateral rope departure

For wrap angle 180°.

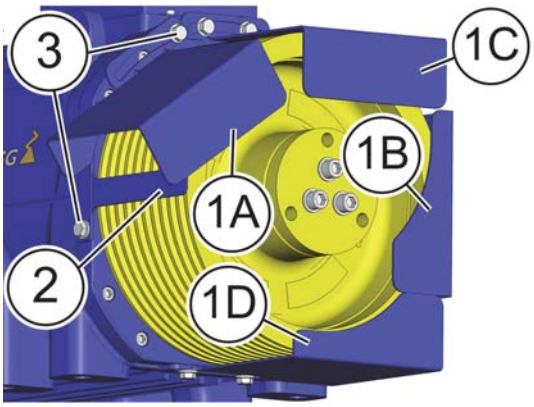


Figure 4-5-5-01 - As-delivered state of rope guard with lateral rope departure

Scope of delivery

- 1A - rope guard left (1 part)
- 1B - rope guard left (1 part)
- 1C - rope guard right (1 part)
- 1D - rope guard right (1 part)
- 2 - 3rd rope retainer (1 part)
- 3 - Hexagon head bolt M12 x 25 - 8.8 mit washer (8 parts)

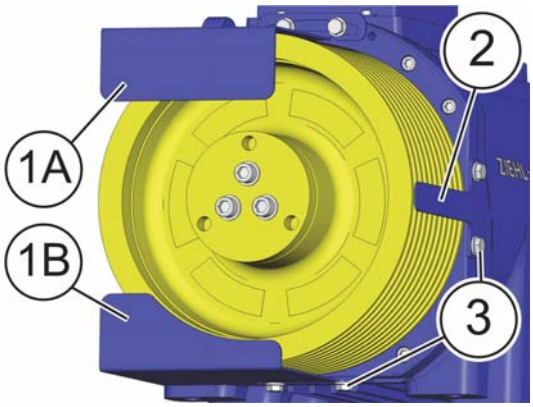


Figure 4-5-5-02 - Left side rope departure version

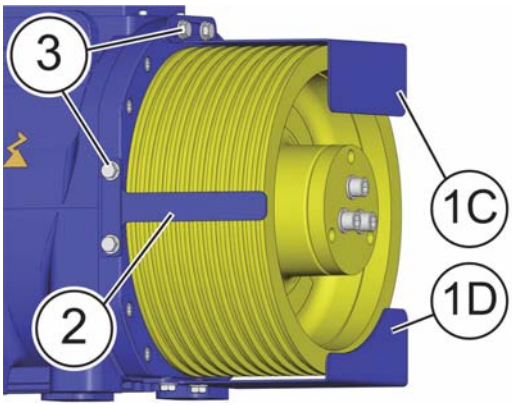


Figure 4-5-5-03 - Right side rope departure version

▷ The rope guard (1A - 1D) is attached to the housing with two hexagon head bolts M12 x 25 - 8.8 (3) and washers.
Tightening torque M12 - 8.8: 79 Nm

▷ The 1A and 1B rope guard is required for the rope departure on the left (see Figure 4-5-5-02).

▷ The 1C and 1D rope guard is required for the rope departure on the right (see Figure 4-5-5-03).

▷ The position of the rope guard can be varied at the slotted holes of the respective rope guard (1A - 1D).

▷ The rope guard (1) can not adjusted.

▷ The 3rd rope retainer (2) is attached with two hexagon head bolts M12 x 25 - 8.8 (3) and washers on the right or left side of the housing, depending on the rope departure, (see Figure 4-5-5-02 or Figure 4-5-5-03).
Tightening torque M12 - 8.8: 79 Nm

4.5.6 Rope guard fastening in the case of a traction sheave diameter of 500 mm - 640 mm

Adjustability on both sides + 5°/- 30°. Normal wrap angles 30° - 185°.

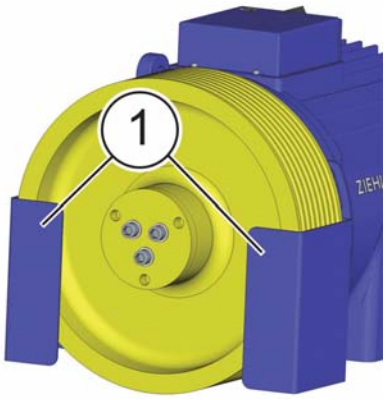


Figure 4-5-6-01 - Rope guard traction sheave 500 - 640

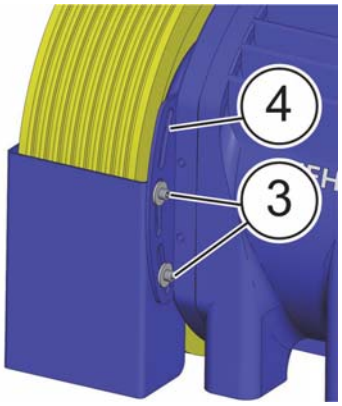


Figure 4-5-6-02 - Setting rope guard

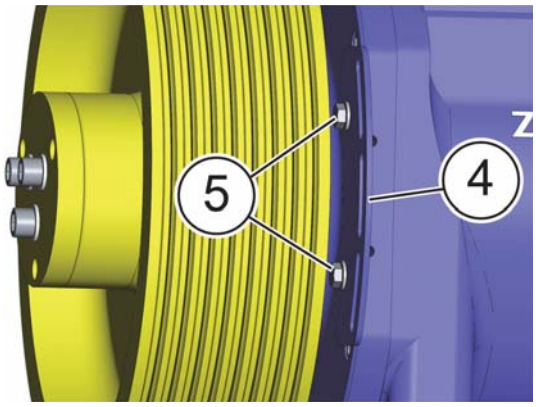


Figure 4-5-6-03 - Bracket mounting

▷ The rope guard (1) is attached to the bracket (4) with two socket cap screws M8 x 16 - 8.8 (3) and washers.

▷ The slotted holes in the bracket (4) enable the required distance to the ropes to be set at the socket cap screws M8 x 16 - 8.8 (2).
Tightening torque M8 - 8.8: 23 Nm

▷ Set the rope guard to a distance of 2 - 3 mm from the ropes.

▷ The bracket (4) is attached with two hexagon head bolts M12 x 25 - 8.8 (5) and washers to the housing.
Tightening torque M12 - 8.8: 79 Nm

4.5.7 Fastening 3rd rope retainer (optional)

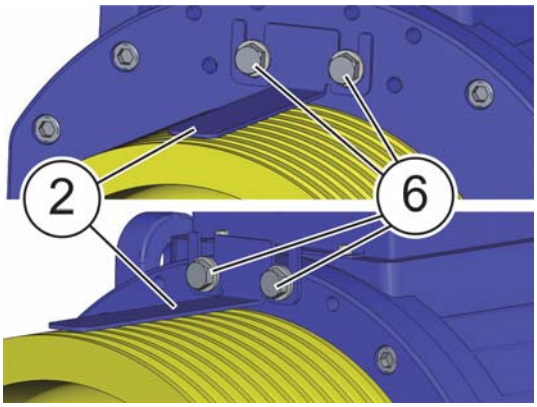


Figure 4-5-7-01 - Attachment variants, 3rd rope retainer

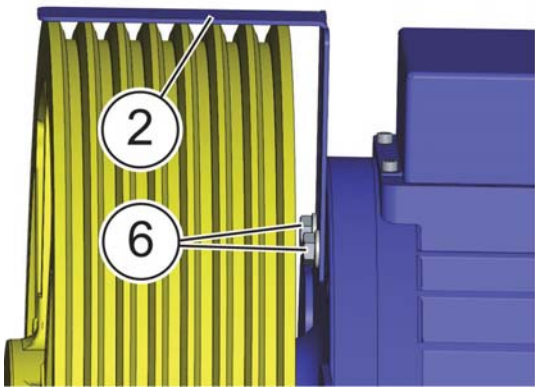


Figure 4-5-7-02 - Attachment variants, 3rd rope retainer

▷ The 3rd rope retainer (2) is attached to the housing with two hexagon head bolts M12 x 25 - 8.8 (3) and washers.
Tightening torque M12 - 8.8: 79 Nm
▷ The slotted holes in the 3rd rope retainer (2) enables the required distance to the ropes to be set at the hexagon head screws M12 x 25 - 8.8 (6).
Tightening torque M12 - 8.8: 79 Nm
▷ The 3rd rope retainer (2) must be fastened in a distance of 2 - 3 mm to the ropes.
▷ Depending on the traction sheave diameter, the mounting method and design of the 3rd rope retainer vary, see Figure 4-5-6-01 and Figure 4-5-6-02
▷ In accordance with EN 81 - 20 the 3rd rope retainer (2) can be mounted in another required position.
▷ The 3rd rope retainer (2) is optionally available.

4.6 Patent situation

Note the patent situation when using elevator machines in a shaft. When using the ZAtop SM250.60B in line with our installation suggestions there are no patent problems.
Viele Patente, die den Einbau im Schacht betreffen, sind mittlerweile abgelaufen. Der Einbau des Antriebs im Schachtkopf ist möglich und der Antrieb darf auch über das Kabinendach ragen, wenn die Sicherheitsvorkehrungen entsprechend getroffen wurden.
Sie haben dennoch die gesetzliche Pflicht, Details Ihrer Aufzugskonstruktion patentrechtlich zu prüfen. Im Zweifel wenden Sie sich gerne an die ZIEHL-ABEGG SE zu Ihrer Unterstützung.

5 Electrical installation

5.1 Safety precautions

Work on electric components may only be carried out by trained electricians or by persons instructed in electricity under the supervision of an electrician in accordance with electrical engineering regulations.

A second person must always be present when working on energized parts or lines who disconnects in case of emergency.

Electrical equipment must be checked regularly: Loose connections are to be re-tightened and damaged cables must be replaced immediately.
Always keep switch cabinets and all electrical supply facilities locked. Access is only allowed for authorized persons using a key or special tool.

Never clean electrical equipment with water or similar liquids.

5.2 EMC directive

Compliance with the EMC directive 2014/30/EU only applies to this product if frequency inverters tested and recommended by ZIEHL-ABEGG SE are used and they are installed in line with the associated operating instructions and are EMC-compatible. If this product is improperly integrated into a system or is combined and operated with non-recommended components, the manufacturer or operator of the complete system is solely responsible for compliance with the EMC directive 2014/30/EU.

5.3 motor

CAUTION!

▷ **The motor cable for the elevator machine is available as an option.**
▷ **The elevator machine may not be connected to the supply voltage without a frequency inverter.**

5.3.1 Cable cross section

The cable cross-section must be specified dependent on the motor current and the ambient conditions (e.g. temperature, wiring method) in accordance with DIN VDE 0298-4.

5.3.2 Type of cable

Always use shielded cables for the motor connections! Both rigid and flexible lines can be installed.
The use of wire-end sleeves is recommended for flexible lines.
Rated voltage U0 / U: 450 / 750 V AC

5.3.3 Cable length

The maximum cable length is 25 m. With a motor line **> 25 m** compliance with DIN EN 12015 (Electromagnetic Compatibility - Interference emissions) and DIN EN 12016 (Electromagnetic Compatibility - Interference immunity) can no longer be guaranteed.

5.3.4 Mechanical connection conditions

Rated motor current [A]	**Thread** **Terminal board**	**Thread** **Cable gland**
up to 20	M8	M25
> 20 - 35	M8	M32
> 35 - 63	M8	M40
> 63 - 80	M8	M50
> 80 - 100	M10	M50
> 100 - 125	M10	M63
> 125	M12	M63

Table 5-3-4

Permissible tightening torque for M8 bolts: 6 Nm
Permissible tightening torque for M10 bolt: 10 Nm
Permissible tightening torque for M12 bolt: 15.5 Nm

5.3.5 Connection

Danger!
The motor cable must be connected to the correct phase of the frequency inverter and the elevator machine: U -> U / V -> V / W -> W.
If the actual direction of travel does not correspond to the selected direction, the turning direction of the elevator machine must be changed in the frequency inverter configuration. If the motor cable is not connected to the correct phase, control of the elevator machine is not possible. It can result in jerky movements or uncontrolled acceleration of the elevator machine.

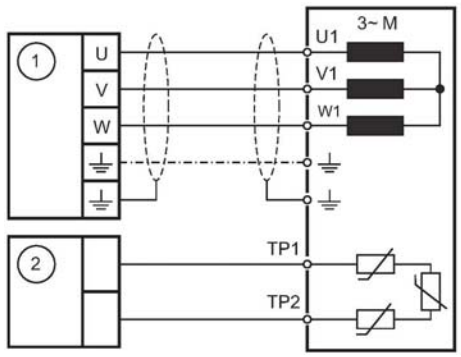


Figure 5-3-5-01
1 Frequency inverter
2 Motor temperature monitoring

5.3.6 Temperature monitoring

- The PTC thermistor motor protection must be connected.
- Only connect to monitor inputs approved for PTC thermistors.
- Maximum permissible test voltage for PTC thermistors 2.5 V DC.

5.3.7 Connection diagram

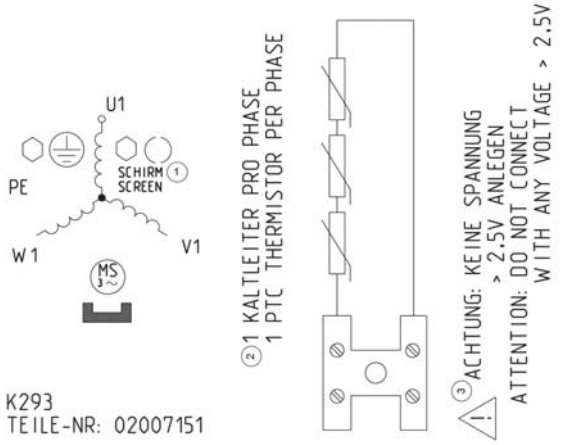


Figure 5-3-7-01
1 Shielding
2 1 PTC thermistor per phase
3 Attention: Do not apply any voltage > 2.5 V!

5.3.8 Connection diagram PT100

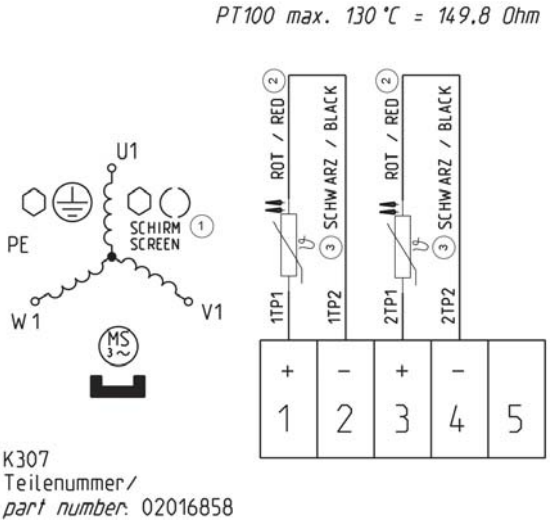


Figure 5-3-8-01
1 Shielding
2 red
3 black

5.4 Absolute encoder

Attention!
- ▷ Never touch the connection contacts on the position absolute encoder or on the cable! The electronics can be destroyed by static electricity.
- ▷ You must discharge your own body before touching. This can be done, for example, by touching a conductive, earthed object (for example bare metal switch cabinet parts) immediately before.
- ▷ Operation of the elevator machine without an absolute encoder is not permissible.

Note:
Removal of the absolute encoder is only possible from the rear. Due to the extremely low failure rate of the absolute encoder, this does not represent a problem.

5.4.1 Lead

Type	ECN1313/ECN1313 SSI	AE-SMRS-BiSS-C	ERN1387
Cable length	0.245 m	5 m	0.245 m
Cable design	Shielded twisted pair cable	Shielded twisted pair cable	Shielded twisted pair cable
Jumper	Jumper M16 x 0.75 (SV120)	D-SUB 15-pin	Jumper M16 x 0.75 (SV120)
Extension in 5 m steps	optional	optional	optional
maximum cable length	25 m	25 m	25 m

Table 5-4-1

5.4.2 Contact assignment

5.4.2.1 Absolute encoder ECN1313/ECN1313 SSI

Pin	Signal	Designation
A	DATA	Data line for communication with the absolute encoder
B	DATA/	Data line inverse
C	5 V sensor up	Sensor cable for absolute encoder voltage (5 V positive)
D	5 V up	Controlled +5 V voltage supply (positive)
E	0 V un	Ground voltage supply absolute encoder (negative)
F	B (sine)	Analog track B (sine)
G	CLOCK/	Clock signal invers
H	CLOCK	Clock signal for serial transfer
J	0 V sensor un	Sensor cable for absolute encoder voltage (negative)
K	A (cosine)	Analog track A (cosine)
L	A/ (cosine)	Analog track A invers (cosine invers)
M	B/ (sine)	Analog track B invers (sine invers)

Table 5-4-2-1

5.4.2.2 Absolute encoder AE-SMRS64-BiSS-C

Pin	Signal	Designation
1	DATA	Data line for communication with the absolute encoder
2	DATA/	Data line inverse
3	-	-
4	VCC	Voltage supply
5	GND	Ground power supply absolute encoder
6	-	-
7	B (sine)	Analog track B (sine)
8	-	-
9	CLOCK/	Clock signal invers
10	CLOCK	Clock signal for serial transfer
11	-	-
12	A (cosine)	Analog track A (cosine)
13	A/ (cosine)	Analog track A invers (cosine invers)
14	B/ (sine)	Analog track B invers (sine invers)
15	GND sense	Ground power supply absolute encoder
Housing	-	Shielding

Table 5-4-2-2

5.4.2.3 Absolute value encoder type ERN1387

Pin	Signal	Designation
A	C (cosine)	Commutation signal (cosine)
B	C/ (cosine)	Commutation signal inverse (inverse cosine)
C	D (sine)	Commutation signal (sine)
D	5 V up	Controlled +5 V voltage supply (positive)
E	0 V un	Ground voltage supply absolute encoder (negative)
F	B (sine)	Analog track B (sine)
G	D/ (sine)	Commutation signal (inverse sine)
H	R	Reference signal
J	R/	Reference signal inverse
K	A (cosine)	Analog track A (cosine)
L	A/ (cosine)	Analog track A invers (cosine invers)
M	B/ (sine)	Analog track B invers (sine invers)

Table 5-4-2-3

5.4.3 Offset

▷ Unless otherwise agreed, the absolute encoder offset is set to 0 This is achieved by connecting DC voltage with **U to +** and **V and W to -**.

▷ The absolute encoder may not be mechanically detached to ensure that the factory settings are not lost. If the absolute encoder has been detached, a new absolute value encoder calibration must be performed with the frequency inverter. For details of the procedure, refer to the frequency inverter operating instructions.

5.5 Brake

Brake type RSO1300

- Also refer to the operating instructions for the brake.

5.5.1 Application

- The brakes are intended for static applications as holding brakes. Dynamic braking must be restricted to emergency and inspection braking. No wear occurs on a holding brake. This means that the brake is maintenance free, and only the air gap has to be checked as described in the “Maintenance and repair - Inspection intervals - Checking the air gap” chapter.

5.5.2 Mechanical releasing

Mechanical release of the brakes is possible by using the manual hand release available as an option. A brake with a mechanical hand release system is available optionally. The hand release system cannot be fitted later. The complete brake must be replaced to retrofit the hand release system.
The mechanical hand release acts on both circuits simultaneously. A separate release of the single circuits for testing urposes is not possible.

5.5.3 Release monitoring

- The brake release monitoring serves as monitoring for redundancy and the operation status of the brakes.
- **The brake release monitoring has to be evaluated; otherwise the type certificate is not fulfilled! The change of state of both brake circuits have to be monitored separately.**
- Release monitoring for the brakes is carried out by a microswitch or inductive proximity switch. For technical data, see chapter "Appendix - Technical data - Microswitch or inductive proximity switch".

5.5.4 Brake control

5.5.4.1 Contactorless - ZAsbc4

Electronic and noise-free activation of the brake.
The brake operating mode is set on site.
For information on installation and commissioning, refer to the ZAsbc4 operating instructions.

5.5.4.2 Electromechanical contactors

Brake type	RSO1300	
Operating voltage	207 V	48 V
Rectifier	Bridge rectifier*	

Table 5-5-4-2
* *Bridge rectifier is not included in the scope of delivery, it is available as option from ZIEHL-ABEGG as article 00154988*

To reduce noises during brake disconnect the brakes should be switched to the alternating current side (K4), while normal operation. The brakes are switched-off slower and thus quieter through the rectifier.
To ensure instantaneous brake engagement in emergencies, during inspection runs and return runs, a second contactor (K3), which disconnects the brake on the direct current side, is used. This contactor is to be switched depending on the safety circuit.

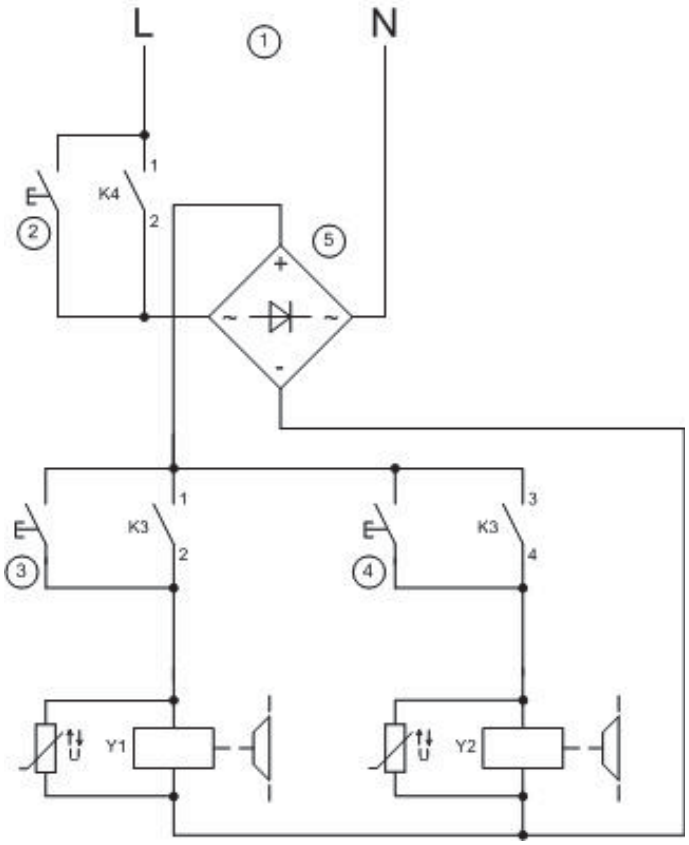


Figure 5-5-4-2-01 - Simplified diagram for brake control
1 Voltage supply
2 Button two circuit test
3 / 4 "Open brake" button
5 Rectifier
K3 Brake contactor, activated by safety circuit
K4 Brake contactor, activated by control or frequency inverter

5.5.5 Connection

- The terminal box for the brake may be removed from the elevator machine and mounted on site for a better attainability.
- The brake is only allowed to be supplied with power when fastened to the motor and after having connected the protective conductor of the motor at the control and the motor side.
- The brakes must be protected with varistors against overvoltage from switching operations. The varistor must lie directly on the coil or its connections.

5.5.6 Connection diagram

Brake wiring diagram with micro switch

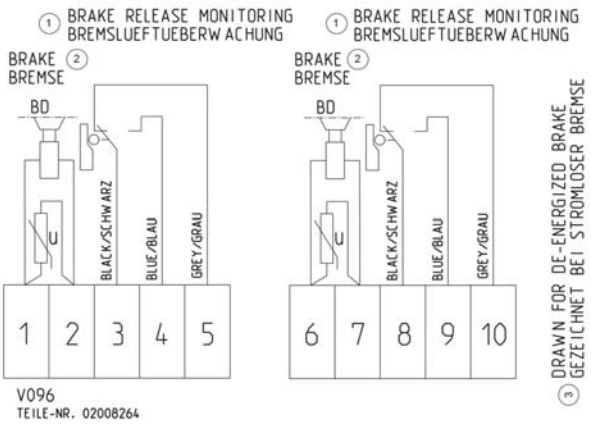


Figure 5-5-6-01
1 Brake release monitoring
2 Brake
3 Shown with currentless brake

Brake wiring diagram with inductive proximity switch

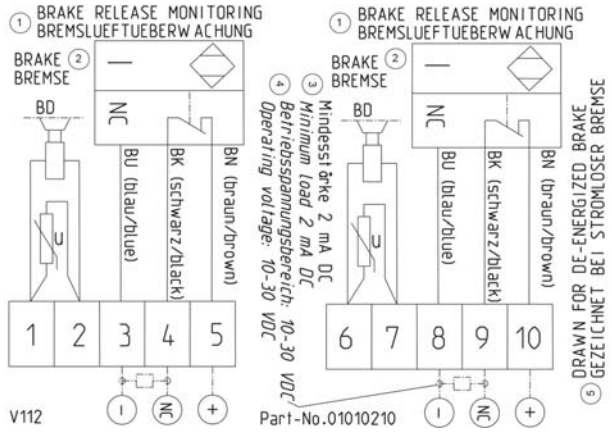


Figure 5-5-6-02
1 Brake release monitoring
2 Brake
3 Minimum strength 2 mA DC
4 Operating voltage range 10 - 30 V DC
5 Shown with currentless brake

5.6 Forced ventilation

The forced ventilation is optional and can be added afterwards.

5.6.1 Installation of forced ventilation side B

5.6.1.1 Technical data

Voltage	220 - 240	[V]
Frequency	50 / 60	[Hz]
Power	48 / 45	[W]
Current	0.24 / 0.23	[A]

Table 5-6-1-1

5.6.1.2 Connection diagram

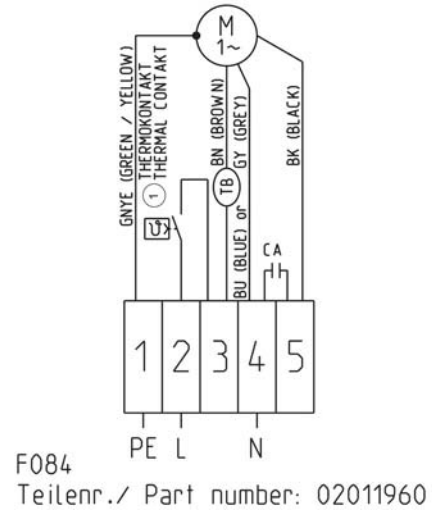


Figure 5-6-1-2-01
1 Thermal contact

5.6.2 Forced ventilation installation on top

5.6.2.1 Technical data

Voltage	220 - 240	[V]
Frequency	50 / 60	[Hz]
Power	2 x 20 / 19	[W]
Current	2 x 0.125 / 0.11	[A]

Table 5-6-2-1

5.6.2.2 Connection diagram

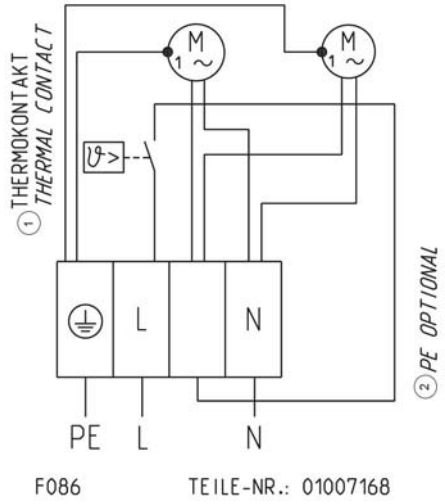


Figure 5-6-2-2-01
1 Thermal contact
2 PE optional

6 Start-up

6.1 Operating conditions

▷ The elevator machine must be installed in a not free accessible machine room or a closed hoistway.
▷ Be aware of the protection class specified on the name plate.
▷ Do not operate the elevator machine in an explosive atmosphere.
▷ Please contact ZIEHL-ABEGG SE in case of orders deviating from the corresponding application conditions.

6.2 First Start-up

Before first-time start-up, check the following:
▷ Installation and electrical connection have been properly completed.
▷ Safety devices are installed.
▷ All leftover installation materials and other foreign materials have been removed.
▷ The protective earth is connected.
▷ Motor protection correctly connected and operative.
▷ Cable entries closed.
▷ Mounting, installation position and accessories are o.k.
▷ Connection data corresponds to the data on the name plate.

6.3 Tests

Tests on elevator systems can be performed by the assembly company or a certification authority or organisation. This involves discovering of failure-critical and hazardous conditions. The relevant operator is responsible for safety. The descriptions below are intended as recommendations for the technical procedure and do not deal in sufficient depth with safety engineering aspects of the relevant system. Therefore, priority is given to the safety engineering specifications of the assembly company or operator. Only trained specialist personnel may carry out tests.

6.3.1 Half load test with current measurement

The test for the 50 % weight compensation should preferably be carried out as follows:
▷ The motor current is to be measured in both travel directions with a half load.
▷ The measured currents should correspond as closely as possible.
▷ The difference between the measured currents should not show a variation of more than 10 %.

Half load test with release of the brake only
▷ The shorting circuit, if installed, should be disabled for the duration of the half load test.
▷ With a half load and the brake released, the car may not move.
▷ After the half load test, the shorting circuit is to be reactivated.

6.3.2 Testing the brake in accordance with EN 81-20:2014

▷ When testing the brakes, the short-circuit wiring has to be deactivated to only test the effect of the brake.
▷ It is recommended to perform the tests when the car position is about in the middle of the shaft.

1. Overload
▷ The test shall be carried out whilst the car is descending at rated speed with 125 % of the rated load and interrupting the supply to the motor and the brake.
▷ When driving upwards with a load of 125%, approx. 2.5 x more losses occur in the drive than for a 100 % load, which leads to a correspondingly rapid heating of the motor. As no shut-off takes place at overtemperature during travel, a journey may only be of short duration.
▷ ZAtop SM132/ZAtopx BD132: maximum 10 seconds
▷ ZAtop SM180/ZAdisc SL506/ZAdisc SL510: maximum 15 seconds
▷ ZAtop SM190/SM200/SM210/SM225/SM250: maximum 20 seconds
▷ ZAsyn2 500AL/ZAsyn 700AL/ZAsyn 860AL: maximum 20 seconds
▷ Longer travel at 125 % nominal load due to a low inspection speed and/or a high travel distance is not permitted.
▷ To avoid this problem, we recommend transporting the test load upwards in 2 parts and with a 125 % load only downwards.

2. Failure of one brake circuit:
▷ The test shall be carried out whilst the car is descending at rated speed with rated load.
▷ To simulate failure of a brake circuit, it must be possible to keep the brake circuits open mechanically independently of one another even when opening the safety circuit.
▷ This condition may not be permanent and must therefore be created using buttons or similar.
▷ At the same time, the safety circuit should be opened when using this function.
▷ For this test, the elevator must be observed.
▷ If no discernible delay occurs, the brake circuit held open is to be closed immediately.
▷ The system should be stopped and the brake tested.

As an example, refer to the principle circuit diagram in the “Electrical installation / Brake / Brake control” chapter. The logic of the principle circuit diagram should be understood. Transferability to the relevant application must be verified and ZIEHL-ABEGG SE provides no guarantee of suitability.

If the circuit is designed in accordance with the principle circuit diagram:
▷ At the nominal speed, press one of the buttons and hold it down until the elevator has stopped.
▷ Repeat the test with the other button to test the second brake circuit.

3. Testing the microswitches / inductive proximity switches
▷ The release monitoring for the brakes must be evaluated.
▷ Before every trip, the change in the state of both brake circuits must be monitored separately.
▷ Switching must thus be tested individually, according to the function as an NC and/or NO contact.
▷ If there is a missing or incorrect signal, the elevator cabin may not leave the stopping point.

6.4 Pull out of safety gear

If the car loaded with the nominal load enters the trap due to a malfunction or during the TÜV certification, it is possible that the trap device is seated rather firmly. In such a case, it is entirely possible that the elevator machine torque is no longer sufficient to pull the car out of the trap.
With gearless elevator machines in the shaft, the elevator machine is usually not accessible. A handwheel is unnecessary in such a layout.
With gearless elevator machines in machine rooms, a handwheel does not make any sense because there is no gear reduction. That is because due to the low moment arm of force, only slight force can be applied. A handwheel could even present a hazard, as even with only a slight imbalance in the installation, it is no longer possible to stop the elevator with the handwheel.
For both cases involving gearless elevator machines:

▷ If the elevator machine torque or the driving capability is not sufficient, a block and tackle or similar should be used.

▷ It is advisable to have a suitable block and tackle on hand for the TÜV inspection.

Note
Note that an overload in the car leads to an increase in the motor torque. 25 % overload results in 150 % of the required motor torque! As regulated elevator machines are normally designed for a maximum torque of ca. 170 - 200 % rated torque, only slight reserves are available during such special cases.
Correspondingly, section **6.3.4 "Capture device on the cabin"** in **EN 81-20:2014** must be followed: “To enable the cabin to be lifted out of the trap more easily, we recommend performing the test close to a door so that the load can be removed from the cabin there.”

6.5 Emergency evacuation

Attention!
The measures for emergency evacuation described below may only be performed by instructed persons for maintenance of the elevator or qualified personnel of elevator companies.

6.5.1 Emergency evacuation by release of the brakes

In case of power failure or failure of the recovery control, emergency rescue is only possible by releasing the brakes. The brake can be released by an electrical emergency power supply or, if available, by a manual hand release.
When the brakes are released manually, the elevator moves in the direction of the greater weight. If there is a balance between the cabin and the counterweight, the cabin must be made heavier by suitable means.
To reduce the acceleration of the elevator, we recommend short-circuiting the motor windings for the evacuation. The short-circuit is generated by the motor contactors or an electronic circuit, as in the ZAdyn 4. This is always effective even in the event of a power failure.
The short-circuit generates a speed-dependent braking torque. The maximum braking torque is achieved at lower speeds.
Depending on the system type and weight ratios, it is possible that due to the short-circuit generated braking torque is not sufficient to limit the lift speed. So the speed must be monitored closely during evacuation and evacuation interrupted if necessary.
Releasing of the brake can be ended when a floor is reached. Now the elevator door can be opened with a triangular key.
The elevator manufacturer's safety instructions have priority!

6.5.2 Releasing of the brake with the lever for hand release

A brake with a mechanical hand release system is available optionally. The hand release system cannot be fitted later. The complete brake must be replaced to retrofit the hand release system.

Figure 6-5-2-01 - Brake not opened

Figure 6-5-2-02 - Brake manuell released

▷ Fit levers for hand release on the mechanical hand release.
▷ The brake is released by deflecting the mechanical hand release by means of the inserted levers of the hand release. Release direction - see arrow.

Danger!
The inserted levers for hand release must be removed after brake hand release action.

6.5.3 Releasing the brake with electric emergency power supply (UPS)

By means of an uninterruptible power supply (UPS) the brake can be opened electrically. For this purpose, for example, the existing dual circuit testing buttons can be used.
See “Brake control principle circuit diagram” in the Brake - Brake control chapter.

6.5.4 Automatic emergency evacuation

The automatic emergency evacuation is described in the operation instructions of the control, the frequency inverter and, if available, an evacuation unit with UPS.

7 Faults and remedy

Excessive temperature / Temperature protection trips

Fault	Causes	Adjustment
Noises on elevator machine	Bearing defective	Contact customer service
	Wrong setting at the frequency inverter	Check setting at the frequency inverter
	Absolute encoder defective	Replace the absolute encoder
Excessive temperature / Temperature protection trips	Surface of the elevator machine is covered	Remove cover from drive or mount with more distance to the elevator machine.
	Ambient temperature higher than 40 °C	Enhance shaft ventilation
	Wrong setting at the frequency inverter	Check setting at the frequency inverter
Elevator machine does not start	Motor phases connected incorrect	Check motor connection
	VVVF defective	Check VVVF
	Brake does not release	See brake faults
Elevator machine does not turn when the brake is released	Brake rotor sticks after a long storage time on the armature disk	Release the brake mechanicaly or remove it and loosen the brake rotor carefully from the armature plate.
Brake switching noises	Brake is switched on the DC-side	Modify the control to AC switching for normal operation. Fit an additional protective circuit.
	Air gap of brake too big	Replace the brake rotors (Special tool required! Contact the customer service of ZIEHL-ABEGG SE).
Brake does not release	Power supply too low. The voltage at the brake is to low.	Check supply, if necessary increase cable cross-section (and transformer)
	Brake control wrong / defective	Check brake control
	Brake coil defective	Replace brake (special tool required. ZIEHL-ABEGG SE Contact customer service).
	Brake worn out	Replace the brake rotors (Special tool required! Contact the customer service of ZIEHL-ABEGG SE).
Brake release monitoring does not switch	Microswitch/inductive proximity switch defective	Replace microswitch/inductive proximity switch
	Contacts dirty	Operate microswitch/inductive proximity switch with a higher contact current, at least 10 mA or replace microswitch/inductive proximity switch or brake

Table 7

8 Service and maintenance

8.1 General notes on maintenance

▷ Observe the safety-at-work regulations!
▷ Disassembling the elevator machine can only be done with special devices!
Caution, strong magnetic force!
▷ Never use a high-pressure cleaner (for example steam jet cleaner) for cleaning the elevator machine!
▷ Take note of abnormal operating noise.
▷ The bearings have a lifetime lubrication. There is no possibility to relubricate. Maintenance is not necessary for the bearings.

To check the brake wear the following instructions have to be referred:
It is not possible to adjust the brakes. The brakes cannot be readjusted. Replace the both brake rotors when the maximum air gap has been reached.

The brake wear has to be checked with the brake closed, therefore:
▷ Make sure that all moving parts have stopped, secure them mechanically if required!
▷ Make sure that the elevator can not be moved from any other person than the one who does the check!

8.2 Inspection intervals

	During commissioning or after the first 3 months	every year
Distance of the rope guard	x	x
Check vibration isolation The thickness of the vibration isolation must be the same on the right and left.	x	x
Checking the air gap of the brake	x	x
Visual inspection of the mounting screws on the housing, brakes and traction sheave. The locking compound must be free of damage.	x	x
Check the traction sheave if worn out		x
Check the microswitch/inductive proximityswitch		x

Table 8-2

Note: All fixing screws on the housing, brakes and traction sheave are marked with locking varnish. That means a loosened screw is optically visible. If a screw does get turned, it must be tightened using the prescribed tightening torque, the old locking varnish needs to be removed and marking has to be made again.

8.2.1 Checking the air gap

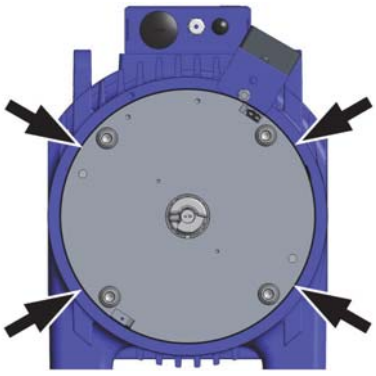


Figure 8-2-1-01 - Air gap measurement position

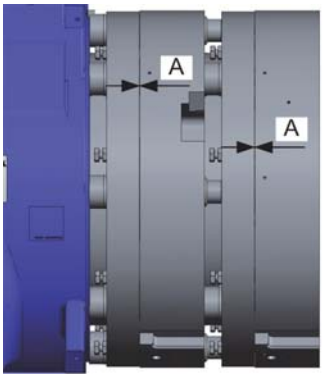


Figure 8-2-1-01 - Air gap measurement

1. The air gap "A" has to be measured three times at the circumference (see arrows) of both brakes. The maximum value of the four has to be taken into account.
2. If the maximum value of the air gap "A" is exceeded on one of the magnets, it must be replaced both brake rotors and the appendant O-rings.
   Maximum admissible air gap "A" after wear: 0.9 mm!
   Caution!
   Feeler gauge do not introduce more than 10 mm into the air gap, to avoid damage to the dampers of noise or deterioration by the springs.

8.3 Spare parts

Spare parts and accessories not supplied by ZIEHL-ABEGG SE have not been tested or approved by us. These parts may be lower in function or quality and there fore can reduce functionality or safety of the elevator machine installation. Will assume no liability or guarantee for damages caused by ZIEHL-ABEGG SE spare parts that are not approved.

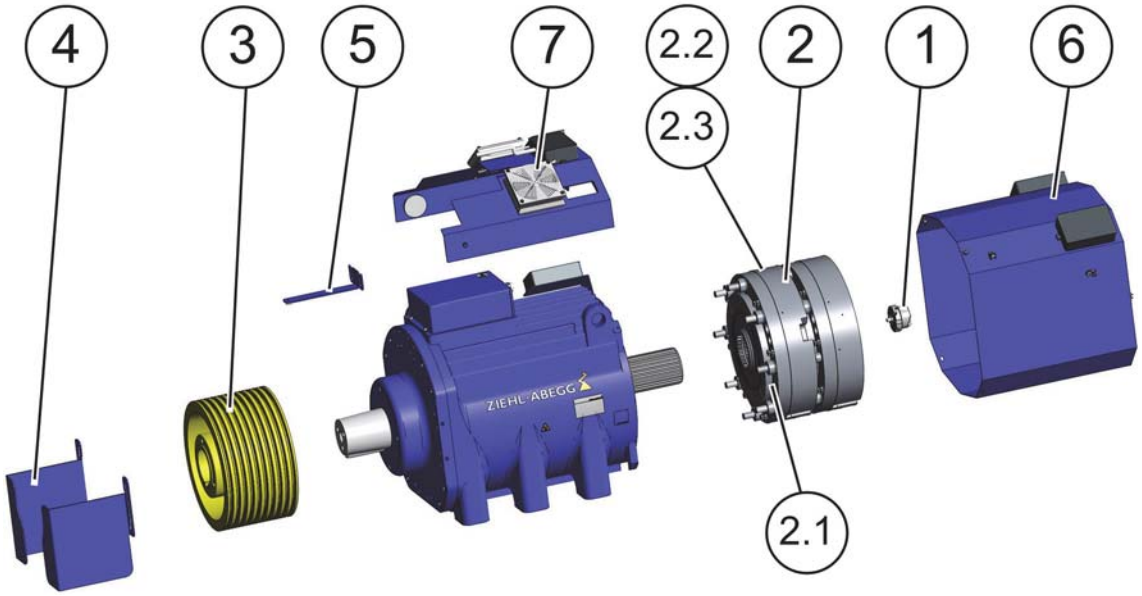


Figure 8-3-01 - Spare parts

Available spare parts:

1. Absolute encoder
2. Complete brake
   2.1 Brake rotors with O-rings
   2.2 Micro switch for brake
   2.3 Inductive proximity switch for brake
3. Traction sheave
4. Rope guard
5. Rope retainer
6. Installation of forced ventilation side B
7. Forced ventilation installation on top

Spare parts are supplied with replacement instructions:

▷ Replacement of the absolute encoder, see A-TIA17_02-D-GB
▷ Replacement of the brake, see A-TIA20_07-D or A-TIA20_07-GB
▷ Replacement of the traction sheave, see A-TIA19_02-D/A-TIA19_02-GB

9 Enclosure

9.1 Technical data

Motor type	**SM250.60B**					
Suspension	1:1	2:1	2:1	2:1	4:1	
Typical payload*	1250	2500	2000	1600	5000	kg
Rated torque	1600					Nm
Maximum torque	2400					Nm
maximum short circut torque	1300 at 30 rpm					
permissible radial load	6000					kg
Nominal brake torque	2 x 2200					Nm
Speed	2	2	2,5	3	1	m/s
Total weight	675	675	695	720	675	kg
Traction sheave						
- Diameter	400	400	500	600	400	mm
- Standard rope diameter	10	10	10	10	10	mm
- Standard number of grooves	10	10	8	8	10	
- Standard groove distance	17					mm

Table 9-1

Table shows typical data, other values possible.
Other rope diameters and groove distances are possible.
* Dependent on travel, compensation ropes may be necessary.

9.1.1 Protection rating

Component	Protection rating
motor	IP 42
Absolute encoder	IP 40
Brake (electrical)	IP 54
Brake (mechanical - without cover)	IP 10
Brake (mechanical - with cover)	IP 30
Complete machine without forced ventilation	IP 21
Forced ventilation	IP 20

Table 9-1-1

9.1.2 Ambient conditions

The user must ensure that the specified ambient conditions are observed.		
Ambient temperature for operation	[°C]	-5 to +40
Humidity	[%]	Maximum 95 / condensation not permitted
Installation height	[m above sea]	Above 1000 Torque reduction by 1 % per 100 m or On time reduction by 1.5 % per 100 m

Table 9-1-2

9.1.3 Brake

Brake type		**RSO1300 (information for each brake circuit)**	
Brake torque	[Nm]	2200	2200
Operating voltage	[V DC]	207	48
Power	[W]	180	180
Electrical protection rating		IP 54	IP 54
Protection class mechanical with cover		IP 10	IP 10
Protection class mechanical without cover		IP 30	IP 30

Table 9-1-3

9.1.3.1 Micro switch

Minimum switching capacity	[mA / V DC]	10 / 12
Maximum rating	[A / V AC]	3 / 250
Recommended rating	[mA / V DC]	10 - 50 / 24

Table 9-1-3-1

9.1.3.2 Inductive proximity switch

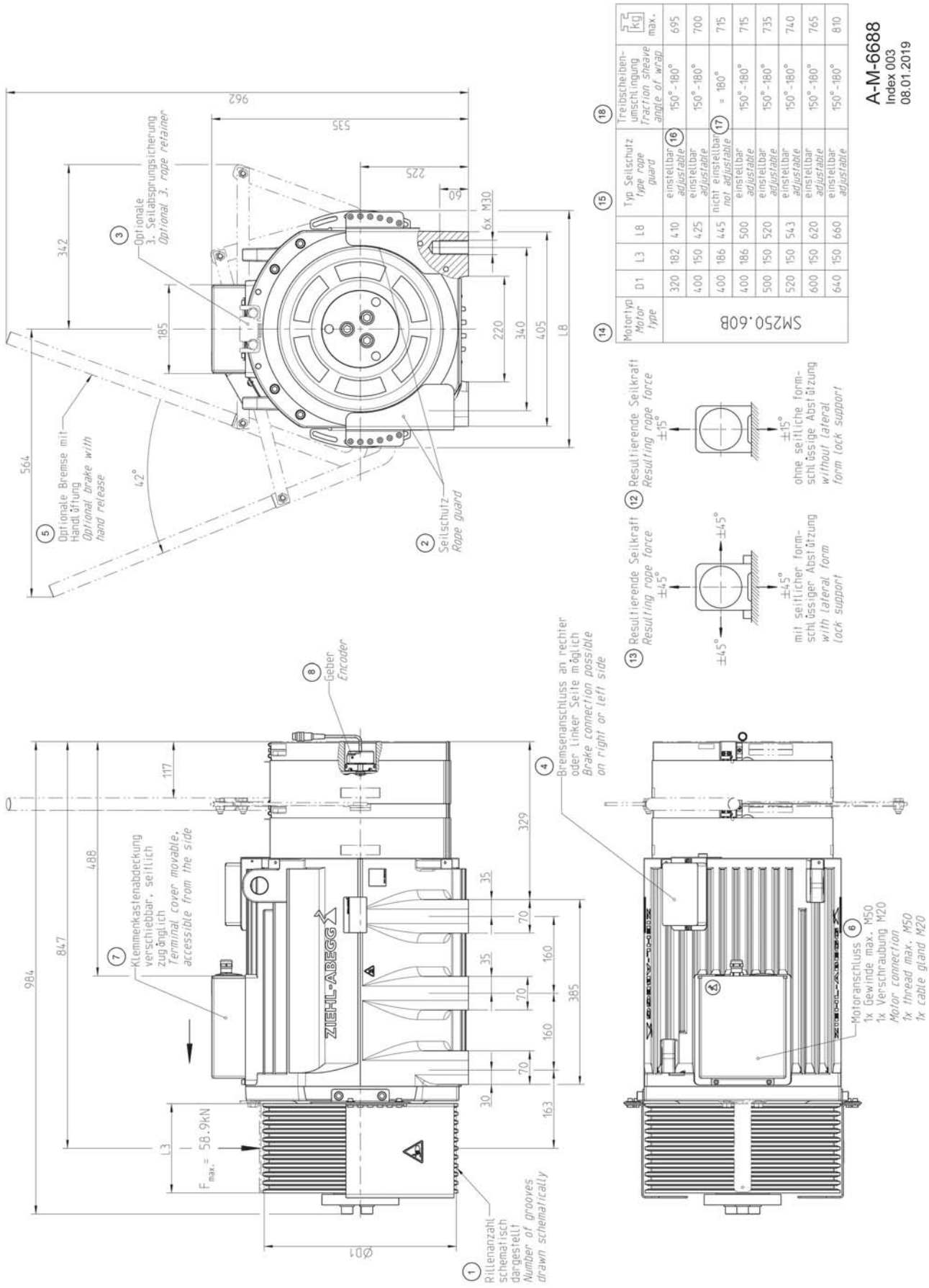
Operating voltage	[V DC]	10 - 30
Rated operating current	[mA DC]	100
Output functions		NC contact / gauge zero

Table 9-1-3-2

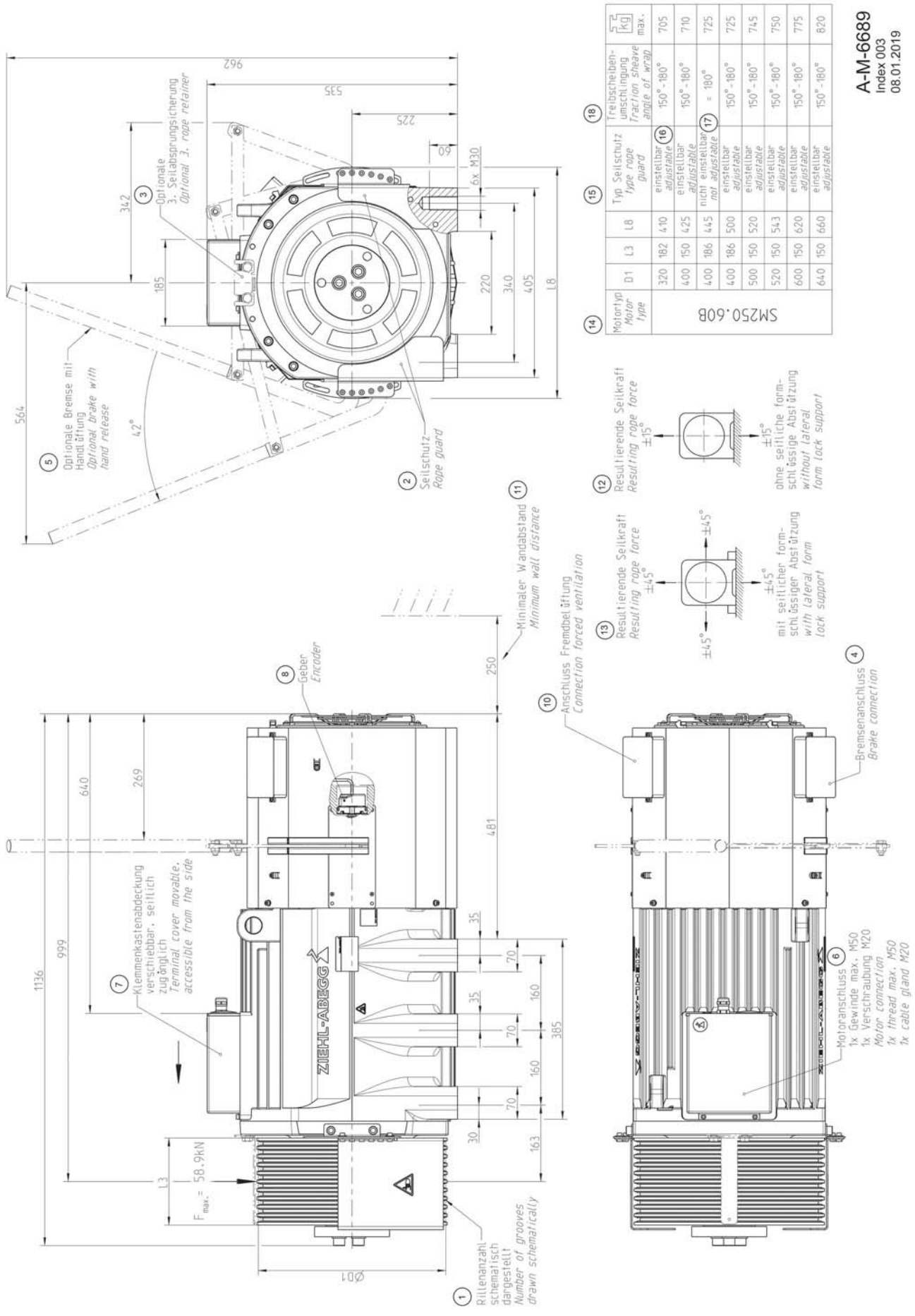
For further information refer to the “Appendix - Brake operating instructions - Assembly and adjustment of the release monitor with inductive proximity switch” chapter.

9.2 Dimension sheets

9.2.1 Dimension sheet ZAtop SM250.60B with/without levers for hand release

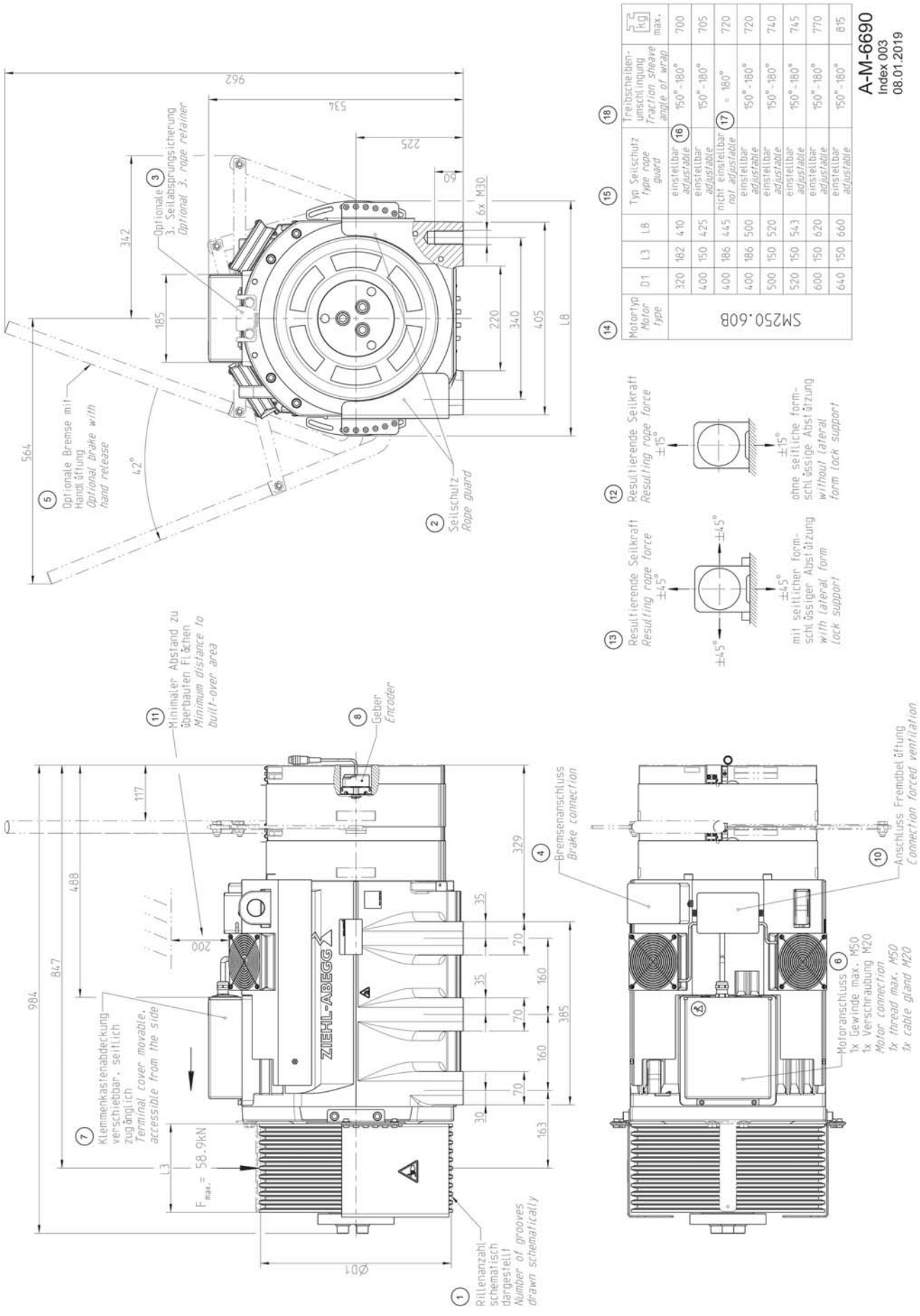


9.2.2 Dimension sheet ZAtop SM250.60B with/without levers for hand release and with forced ventilation side B



Motortyp Motor type	D1	L3	L8	Typ Seilschutz type rope guard	Treibscheiben-umschlingung traction sheave angle of wrap	max. kg
SM250.60B	320	182	410	einstellbar adjustable	150°-180°	705
	400	150	425	einstellbar adjustable	150°-180°	710
	400	186	445	nicht einstellbar not adjustable	= 180°	725
	400	186	500	einstellbar adjustable	150°-180°	725
	500	150	520	einstellbar adjustable	150°-180°	745
	520	150	543	einstellbar adjustable	150°-180°	750
	600	150	620	einstellbar adjustable	150°-180°	775
	640	150	660	einstellbar adjustable	150°-180°	820

9.2.3 Dimension sheet ZAtop SM250.60B with/without levers for hand release and with forced ventilation on top



Motortyp Motor type	D1	L3	L8	Typ Seilschutz type rope guard	Treibscheiben-umschlingung Traction sheave angle of wrap	max. kg
SM250.60B	320	182	410	einstellbar adjustable	150°-180°	700
	400	150	425	einstellbar adjustable	150°-180°	705
	400	186	445	nicht einstellbar not adjustable	= 180°	720
	400	186	500	einstellbar adjustable	150°-180°	720
	500	150	520	einstellbar adjustable	150°-180°	740
	520	150	543	einstellbar adjustable	150°-180°	745
	600	150	620	einstellbar adjustable	150°-180°	770
	640	150	660	einstellbar adjustable	150°-180°	815

9.2.4 Legend for dimension sheets

1 Number of grooves represented schematically
2 Rope guard
3 Optional 3rd rope retainer
4 A-M-6688 - Brake connection possible on right or left side
A-M-6689 + A-M-6690 - Brake connection
5 Optional brake with manual hand release
6 Motor connection
1 x thread maximum M50
1 x with cable gland M20
7 Terminal cover movable, accessible from the side
8 Absolute encoder
10 Connection forced ventilation
11 Minimum wall distance
12 Resulting rope force without lateral form lock support
13 Resulting rope force with lateral form lock support
14 Motor type
15 Type rope guard
16 adjustable
17 Cannot be set
18 Traction sheave angle of wrap - adjustable rope guard angle of wrap

9.3 EC/EU declaration of conformity

- Translation - (english)

A-KON16_01-GB
1612 Index 001

Manufacturer: ZIEHL-ABEGG SE
Heinz-Ziehl-Straße
74653 Künzelsau
Germany

The manufacturer shall bear sole responsibility for issuing this EC/EU declaration of conformity.

Product description: **ZAtop** Gearless elevator machine

Type: **SM160...** **SM190...** **SM200...** **SM225...** **SM250...**

The type specifications contain further additions for different versions, for example SM250.60B-20/S.

Valid from serial number: 16010001/1 or higher

The above mentioned products of this declaration fulfil all relevant provisions of the following Directives of the Union:

Machinery directive 2006/42/EC

EMC Directive 2014/30/EU

The following harmonised standards have been used:

EN ISO 12100:2010	Safety of machine tools - General principles for design - Risk assessment and risk reduction
EN 60034-1:2010 + AC:2010	Rotating electrical machines - Part 1: Rating and performance
EN 81-20:2014	Safety rules for the construction and installation of elevators - Lifts for the transport of persons and goods - Part 20: Passenger and goods passenger elevators
EN 60204-1:2006 + A1:2009 + AC:2010	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

For the assessment of the products concerning electromagnetic compatibility the following standards have been used.

EN 12015:2014	Electromagnetic compatibility- Productfamily standard for lifts, escalators and moving walks - Emission

This declaration relates exclusively to the product in the state in which it was placed on the market, and excludes components which are added and/or operations carried out subsequently by the final user.

The authorised representative for the assembly of the technical file is:
Mr. Roland Hoppenstedt (see above for address).

Künzelsau, 20.04.2016
(location, date of issue)

ZIEHL-ABEGG SE
Werner Bundscherer
Director Drive Division
(name, function)

(Signature)

ZIEHL-ABEGG SE
Roland Hoppenstedt
Technical Director Drive Division
(name, function)

i.V. R. Hoppenstedt

(signature)

9.4 Operating instructions brake

Installation and Operational Instructions for ROBA-stop®-silenzio® Type 896.30_.3 Size 1300

(E079 13 014 006 4 EN)

Design according to
Drawing number: E079 13 014 000 1 1A (with hand release)
Drawing number: E079 13 014 000 1 1B (without hand release)

Please read these Operational Instructions carefully and follow them accordingly!

Ignoring these Instructions can lead to lethal accidents, malfunctions, brake failure and damage to other parts.
These Installation and Operational Instructions (I + O) are part of the brake delivery.
Please keep them handy and near to the brake at all times.

Contents:

Attachment:

- ❑ Drawing E079 13 014 000 11A for design with hand release
- ❑ Drawing E079 13 014 000 11B for design without hand release

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Installation and Operational Instructions for ROBA-stop®-silenzio® Type 896.30_.3 Size 1300

(E079 13 014 006 4 EN)

Safety and Guideline Signs

DANGER

Immediate and impending danger, which can lead to severe physical injuries or to death.

CAUTION

Danger of injury to personnel and damage to machines.

Please Observe!
Guidelines on important points.

Certification

EU Type Examination Certificate (Elevator Directive): EU-BD 783

Guidelines on the Declaration of Conformity
A conformity evaluation has been carried out for the product (electromagnetic safety brake) in terms of the EU Low Voltage Directive 2014/35/EU. The Declaration of Conformity is laid out in writing in a separate document and can be requested if required.

Guidelines on the EMC Directive (2014/30/EU)
The product cannot be operated independently according to the EMC directive.
Due to their passive state, brakes are also non-critical equipment according to the EMC.
Only after integration of the product into an overall system can this be evaluated in terms of the EMC.
For electronic equipment, the evaluation has been verified for the individual product in laboratory conditions, but not in the overall system.

Guidelines on the Machinery Directive (2006/42/EC)
The product is a component for installation into machines according to the machinery directive 2006/42/EC.
The brakes can fulfil the specifications for safety-related applications in coordination with other elements.
The type and scope of the required measures result from the machine risk analysis. The brake then becomes a machine component and the machine manufacturer assesses the conformity of the safety device to the directive.
It is forbidden to start use of the product until you have ensured that the machine accords with the regulations stated in the directive.

Guidelines on the EU Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment
The electromagnetic brake as well as the rectifiers / microswitches / proximity switches required for control / self-monitoring fulfil the requirements laid down in the EU Directive 2011/65/EC (RoHS).
(Restrictions on the use of certain hazardous substances, such as lead (0.1 %), mercury (0.1 %), cadmium (0.01 %), hexavelent chromium (0.1 %), polybrominated biphenyls (PBB) (0.1 %), polybrominated diphenylethers (PBDE) (0.1 %))

Guidelines on the ATEX Directive
Without a conformity evaluation, this product is not suitable for use in areas where there is a high danger of explosion.
For application of this product in areas where there is a high danger of explosion, it must be classified and marked according to directive 2014/34/EU.

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Installation and Operational Instructions for ROBA-stop®-silenzio® Type 896.30_.3 Size 1300

(E079 13 014 006 4 EN)

Safety Regulations

These Safety Regulations are user hints only and may not be complete!

General Guidelines

DANGER

Danger of death!
Do not touch voltage-carrying cables and components.

Brakes may generate further risks, among other things:

Hand injuries

Danger of seizure

Contact with hot surfaces

Magnetic fields

Severe injury to people and damage to objects may result if:

- ❒ the electromagnetic brake is used incorrectly.
- ❒ the electromagnetic brake is modified.
- ❒ the relevant standards for safety and / or installation conditions are ignored.

During the required risk assessment when designing the machine or system, the dangers involved must be evaluated and removed by taking appropriate protective measures.

To prevent injury or damage, only specialist personnel are allowed to work on the components.
They must be familiar with the dimensioning, transport, installation, inspection of the brake equipment, initial operation, maintenance and disposal according to the relevant standards and regulations.

Before product installation and initial operation, please read the Installation and Operational Instructions carefully and observe the Safety Regulations. Incorrect operation can cause injury or damage. At the time these Installation and Operational Instructions go to print, the electromagnetic brakes accord with the known technical specifications and are operationally safe at the time of delivery.

- ❒ Technical data and specifications (Type tags and documentation) must be followed.
- ❒ The correct connection voltage must be connected according to the Type tag and wiring guidelines.
- ❒ Check electrical components for signs of damage before putting them into operation. Never bring them into contact with water or other fluids.
- ❒ Please observe the EN 60204-1 requirements for electrical connection when using in machines.

Only carry out installation, maintenance and repairs in a de-energised, disengaged state and secure the system against inadvertent switch-on.

Guidelines for Electromagnetic Compatibility (EMC)

In accordance with the EMC directives 2014/30/EU, the individual components produce no emissions. However, functional components e.g. mains-side energisation of the brakes with rectifiers, phase demodulators, ROBA®-switch devices or similar controls can produce disturbance which lies above the allowed limit values. For this reason it is important to read the Installation and Operational Instructions very carefully and to keep to the EMC directives.

Application Conditions

The catalogue values are guideline values which have been determined in test facilities. It may be necessary to carry out your own tests for the intended application. When dimensioning the brakes, please remember that installation situations, braking torque fluctuations, permitted friction work, bedding-in condition / conditioning of the brake linings and wear as well as general ambient conditions can all affect the given values. These factors should therefore be carefully assessed, and alignments made accordingly.

- ❒ Mounting dimensions and connection dimensions must be adjusted according to the size of the brake at the place of installation.
- ❒ Use of the brake in extreme environmental conditions or outdoors, directly exposed to the weather, is not permitted.
- ❒ The brakes are designed for a relative duty cycle of 80 %. The max. permitted switching frequency is 240 1/h. On overexcited brakes, the switching frequency must not exceed 180 1/h. These values are valid for intermittent periodic duty S3 80 %. The permitted surface temperature on the brake flange must not exceed 90 °C at a max. ambient temperature of 40 °C. In case of temperatures in the limit range, please provide external fans.
- ❒ The braking torque is dependent on the current bedding-in condition of the brake. Bedding in / conditioning of the friction linings is necessary.
- ❒ The brakes are only designed for dry running. The torque is lost if the friction surfaces come into contact with oil, grease, water or similar substances or any other foreign bodies.
- ❒ The surfaces of the outer components have been phosphated manufacturer-side to form a basic corrosion protection.

CAUTION

The rotors may rust up and seize up in corrosive ambient conditions and / or after longer downtimes.
The user is responsible for taking appropriate countermeasures.

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Installation and Operational Instructions for ROBA-stop®-silenzio® Type 896.30_.3 Size 1300

(E079 13 014 006 4 EN)

Safety Regulations

These Safety Regulations are user hints only and may not be complete!

Dimensioning

Attention!
When dimensioning the brake, please take into consideration whether a load torque is present when selecting the protection.

- ❒ Load torques reduce the deceleration torque available.
- ❒ Load torques may increase the output speed:
  - ➔ during a possible processing time in the controls
  - ➔ during the brake downtime

When calculating the friction work, please observe that the brake nominal torque is subject to a tolerance.

Climate Conditions

The electromagnetic brake is suitable for applications with an ambient temperature of between -5 °C and +40 °C.

CAUTION

Reduction in braking torque possible
Condensation can form on the brake and cause a loss in braking torque:

- ❒ due to fast changes in temperature
- ❒ at temperatures of around or under freezing point

The user is responsible for taking appropriate countermeasures (e.g. forced convection, heating, drain screw).

CAUTION

Brake malfunction possible
Condensation can form on the brake and cause malfunctions:

- ❒ at temperatures around or under freezing point, the brake can freeze over and not release any more.

The user is responsible for taking appropriate countermeasures (e.g. forced convection, heating, drain screw).

The system function must be checked by the user after longer downtimes.

At high temperatures and in high humidity or with occurring dampness, the rotor can seize up to the armature disk or the bearing shield / the flange plate after longer downtimes.

CAUTION

Temperatures of over 80 °C on the brake mounting flange can have a negative effect on the switching times, the braking torque levels and the noise damping behaviour.

Intended Use

This safety brake is intended for use in electrically operated elevators and goods elevators. Furthermore, this brake can be used
as a braking device acting on the traction sheave or the shaft of the traction sheave, as part of the protection device against overspeed for the car moving in upwards direction and as a braking element against unintended car movement.

Earthing Connection

The brake is designed for Protection Class I. This protection covers not only the basic insulation, but also the connection of all conductive parts to the protective conductor (PE) on the fixed installation. If the basic insulation fails, no contact voltage will remain. Please carry out a standardised inspection of the protective conductor connections to all contactable metal parts!

Class of Insulation F (+155 °C)

The insulation components on the magnetic coils are manufactured at least to class of insulation F (+155 °C).

Protection

(mechanical without cover) IP10: Protection against large body surfaces and large foreign bodies > 50 mm in diameter. Water spray coming from any direction may reduce the braking torque.

(mechanical with cover) IP30: Protected against penetration of solid foreign bodies > 2.5 mm diameter. Water spray coming from any direction may reduce the braking torque.

(electrical) IP54: Dust-proof and protected against contact as well as against water spray from any direction.

Brake Storage

- ❑ Store the brakes in a horizontal position, in dry rooms and dust and vibration-free.
- ❑ Relative air humidity < 50 %.
- ❑ Temperature without major fluctuations within a range from -5 °C up to +40 °C.
- ❑ Do not store in direct sunlight or UV light.
- ❑ Do not store aggressive, corrosive substances (solvents / acids / lyes / salts / oils / etc.) near to the brakes.

For longer storage of more than 2 years, special measures are required (please contact the manufacturer).

Storage acc. DIN EN 60721-3-1 (including the limitations / additions described above): 1K3; 1Z1; 1B1; 1C2; 1S3; 1M1

Handling

Before installation, the brake must be inspected and found to be in proper condition.
The brake function must be inspected both **once attachment has taken place** as well as **after longer system downtimes**, in order to prevent the drive starting up against possibly seized linings.

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(E079 13 014 006 4 EN)

Safety Regulations

These Safety Regulations are user hints only and may not be complete!

User-implemented Protective Measures:

- ❒ Please cover moving parts to protect **against injury through seizure**.
- ❒ Place a cover on the magnetic part to protect **against injury through high temperatures**.
- ❒ **Protection circuit**: When using DC-side switching, the coil must be protected by a suitable protection circuit according to VDE 0580, which is integrated in *mayr*®-rectifiers. To protect the switching contact from consumption when using DC-side switching, additional protective measures are necessary (e.g. series connection of switching contacts). The switching contacts used should have a minimum contact opening of 3 mm and should be suitable for inductive load switching. Please make sure on selection that the rated voltage and the rated operating current are sufficient. Depending on the application, the switching contact can also be protected by other protection circuits (e.g. *mayr* ®-spark quenching unit, half-wave and bridge rectifiers), although this may of course then alter the switching times.
- ❒ Take precautions **against freeze-up of the friction surfaces** in high humidity and at low temperatures.

Standards, Directives and Regulations Used and To Be Applied

DIN VDE 0580	Electromagnetic devices and components, general specifications
2014/35/EU	Low Voltage Directive
CSA C22.2 No. 14-2010	Industrial Control Equipment
UL 508 (Edition 17)	Industrial Control Equipment
2014/33/EU	Elevator Directive
EN 81-20	Safety rules for the construction and installation of lifts – Part 20: Passenger and goods passenger lifts
EN 81-50	Safety rules for the construction and installation of lifts - Examinations and tests – Part 50: Design rules, calculations, examinations and tests of lift components
BGV C1	(previously VGB 70) Safety regulations for theatre stage technical systems
EN ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction
DIN EN 61000-6-4	Interference emission
EN 12016	Interference immunity (for elevators, escalators and moving walkways)

Liability

The information, guidelines and technical data in these documents were up to date at the time of printing. Demands on previously delivered brakes are not valid.
Liability for damage and operational malfunctions will not be taken if:

- the Installation and Operational Instructions are ignored or neglected.
- the brakes are used inappropriately.
- the brakes are modified.
- the brakes are worked on unprofessionally.
- the brakes are handled or operated incorrectly.

Guarantee

- ❒ The guarantee conditions correspond with the Chr. Mayr GmbH + Co. KG sales and delivery conditions.
- ❒ Mistakes or deficiencies are to be reported to *mayr*® at once!

CE Identification

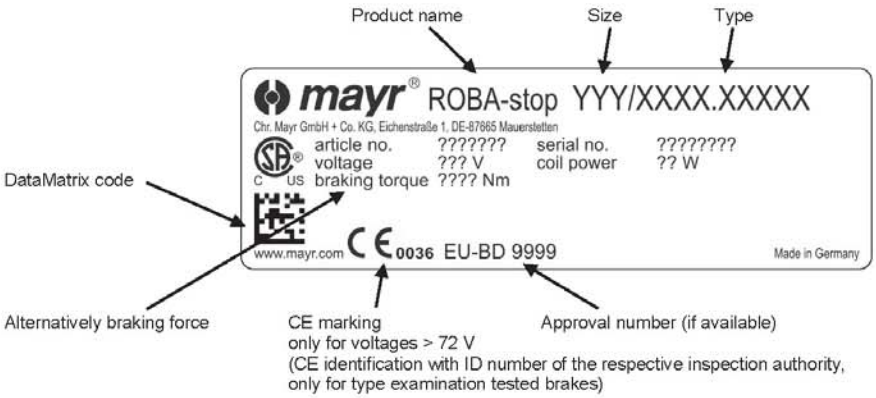
CE according to the Low Voltage Directive 2014/35/EU and the Elevator Directive 2014/33/EU

Conformity Markings

c SP us in terms of the Canadian and American approval

Identification

mayr® components are clearly marked and described on the Type tag:



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Installation and Operational Instructions for ROBA-stop®-silenzio® Type 896.30_.3 Size 1300

(E079 13 014 006 4 EN)

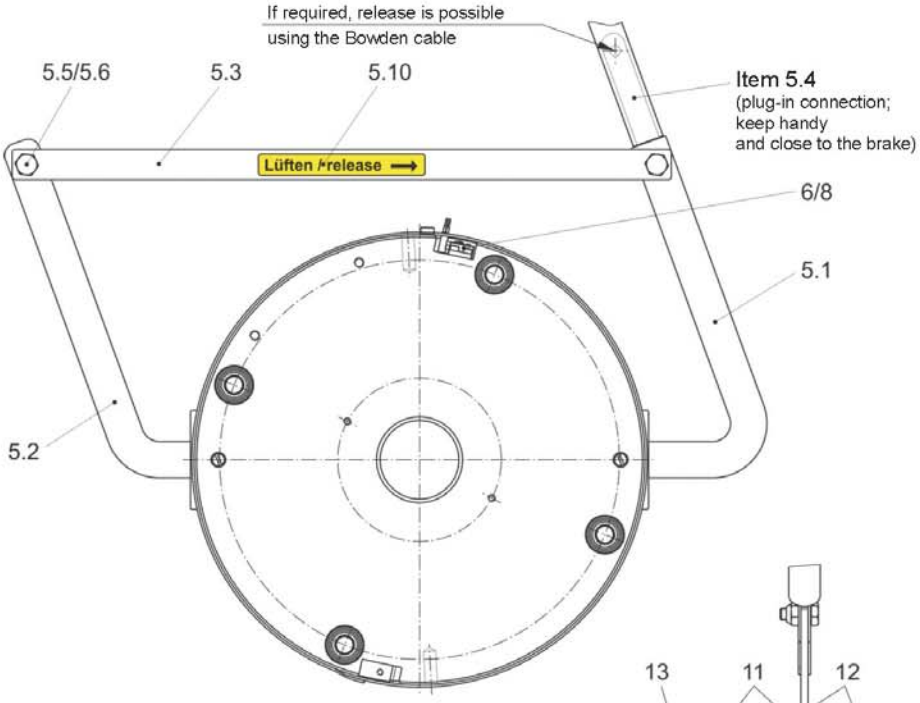

Fig. 1

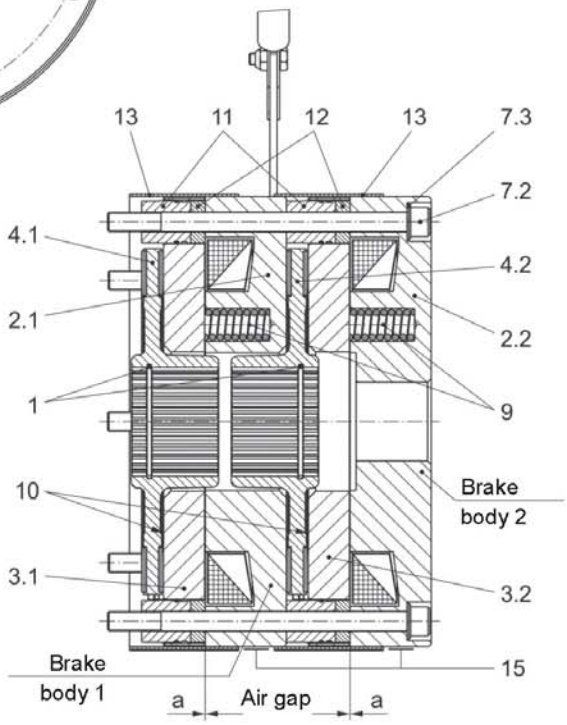

Fig. 2

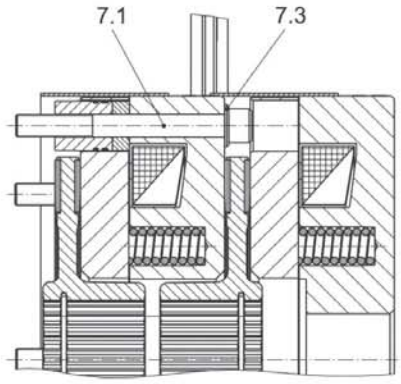

Fig. 3

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Installation and Operational Instructions for ROBA-stop®-silenzio® Type 896.30_.3 Size 1300

(E079 13 014 006 4 EN)

Parts List (Only use *mayr*® original parts)

Item	Name			Pcs.
1	O-ring			2
2.1	Coil carrier 1 assembly (with magnetic coil)			1
2.2	Coil carrier 2 assembly (with magnetic coil)			1
3.1	Armature disk 1			1
3.2	Armature disk 2			1
4.1	Rotor 1			1
4.2	Rotor 2			1
5	Hand release			1
5.1	Hand release lever, right			1
5.2	Hand release lever, left			1
5.3	Tension lever			2
5.4	Pipe			1
5.5	Hexagon head screw	M10x25		2
5.6	Hexagon nut	M10		2
5.7	Hexagon head screw	M12		2
5.8	Thrust spring			4
5.9	Tensile block			4
5.10	Guideline sign yellow			1
6	Release monitoring assembly with microswitch (dependent on Type)			2
6.1	Microswitch incl. adaptor plate		(Page 13 / Fig. 6)	2
6.2	Cap screw	M4 x 8	(Page 13 / Fig. 6)	4
6.3	Hexagon head screw	M5 x 25	(Page 13 / Fig. 6)	2
6.4	Hexagon nut	M5	(Page 13 / Fig. 6)	2
6.5	Spring washer		(Page 13 / Fig. 6)	2
7.1	Cap screw	M16 x 250		4
7.2	Cap screw	M16 x 150		4
7.3	Washer			8
8	Release monitoring assembly with proximity switch (dependent on Type)			2
8.1	Proximity switch incl. adaptor plate		(Page 14 / Fig. 7)	2
8.2	Cap screw	M4 x 10	(Page 14 / Fig. 7)	4
8.3	Spacer		(Page 14 / Fig. 7)	2
8.4	Switching bolt		(Page 14 / Fig. 7)	2
8.5	Spring lock washer		(Page 14 / Fig. 7)	2
9	Thrust spring			36
10	Shoulder screw			4
11	Distance bolt			12
12	Distance ring			12
13	Cover			2
14	Noise damping unit		(Page 11)	16
15	Type tag			2

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Installation and Operational Instructions for ROBA-stop®-silenzio® Type 896.30_.3 Size 1300

(E079 13 014 006 4 EN)

Technical Data

Braking torque [1]:	2 x 2200 Nm
Nominal voltages:	2 x 24 V 2 x 48 V 2 x 104 V 2 x 207 V
Coil power (at 24 V):	2 x 178 W
Coil power (at 48 V):	2 x 180 W
Coil power (at 104 V):	2 x 178 W
Coil power (at 207 V):	2 x 180 W
Inductivity (at 24 V):	2 x 3.3 H
Inductivity (at 48 V):	2 x 13 H
Inductivity (at 104 V):	2 x 60 H
Inductivity (at 207 V):	2 x 227 H
Motor nominal speed:	400 rpm
Overspeed:	460 rpm
Max. hand release force at nominal torque:	approx. 360 N
Rotor thickness, new condition:	$18_{-0.05}$ mm
Nominal air gap "a" per brake body:	0.5 mm
Maximum air gap [2] per brake body:	0.9 mm
Tightening torque Items 7.1 and 7.2:	300 Nm
Wrench opening Items 7.1 and 7.2:	SW 14
Protection (electrical):	IP54
Protection (mechanical) without cover:	IP10
Protection (mechanical) with cover:	IP30
Duty cycle with 240 switchings/h:	max. 80 %
Electrical connection (coil):	2 x 0.88 mm²
Electrical connection (microswitch):	3 x 0.54 mm²
Electrical connection (proximity switch):	3 x 0.14 mm²
Ambient temperature:	-5 °C to +40 °C
Mass (without hand release):	146 kg
Mass (with hand release):	150 kg

[1] The braking torque (nominal torque) is the torque effective in the shaft train on slipping brakes with a sliding speed of 1 m/s referring to the mean friction radius.

[2] Once the maximum air gap has been reached, the rotors must be replaced. However, the brake already becomes louder at an air gap > "a" +0.2 mm.

At temperatures of around or under freezing point, condensation can strongly reduce the braking torque. The user is responsible for taking appropriate countermeasures. The customer is responsible for providing a protective cover against contamination caused by construction sites.

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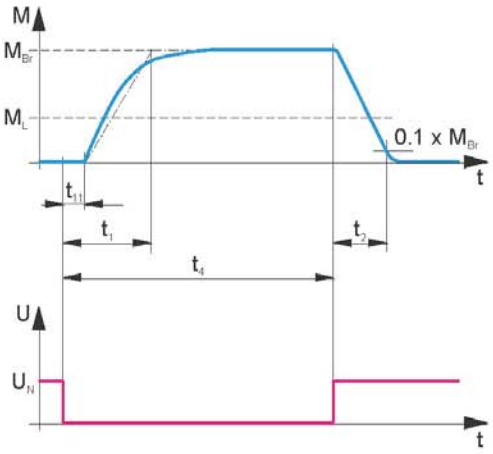
Table 2: Switching times

Attraction t_2:	950 ms
Drop-out t_0 DC:	85 ms
Drop-out t_{50} DC [3]:	150 ms
Drop-out t_{90} DC [4]:	200 ms
Drop-out t_{11} AC:	325 ms
Drop-out t_1 AC:	1050 ms

[3] Referring to the effective braking torque on disconnection from holding voltage (nominal voltage)
[4] Referring to the nominal braking torque on disconnection from holding voltage (nominal voltage)
The stated switching times can only be achieved using the respective correct electrical wiring. This also refers to the protection circuit for brake control and the response delay times of all control components. If the brake is operated using overexcitation, the respective switch-on and switch-off times for overexcitation must be taken into account (inadvertent movements of the elevator cage).
The use of varistors for spark quenching increases the DC-side switching times.

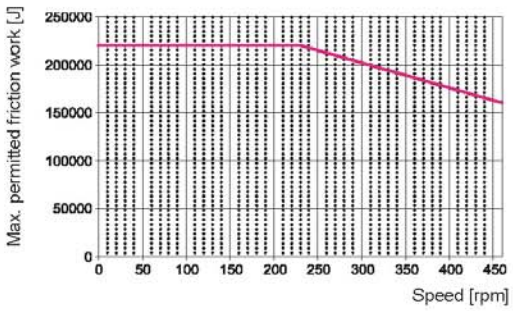
Torque-Time Diagram



Key

M_{Br} = Braking torque
M_L = Load torque
t_1 = Connection time
t_{11} = Response delay on connection (≙ t_0 acc. Type Examination Certificate)
t_2 = Separation time
t_4 = Slip time + t_{11}
U_N = Coil nominal voltage

Max. Permitted Friction Work per Brake Circuit Dependent on the Speed



The Friction Work Diagram is only valid for conditioned (ground-in) rotors (4.1/4.2). After installation, the rotors (4.1/4.2) must be conditioned by the user.

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Application

- ROBA-stop®-silenzio® for use as a holding brake with occasional EMERGENCY STOP braking actions.
- Horizontal brake axis
- The max. permitted speed and friction work (see Technical Data and Diagram on page 9) must be observed.

Design

The ROBA®-silenzio® is a spring applied, electromagnetically releasing dual circuit safety brake - a component in terms of DIN VDE 0580.
It is designed for installation into gearless elevator machinery for use as a holding brake with occasional EMERGENCY STOP braking actions.
On dimensioning, the braking torque, the speed as well as the permitted friction work in case of EMERGENCY STOP need to be taken into consideration for safe holding of the load torque and safe compliance with the required braking distance.
Furthermore, the ROBA-stop®-silenzio® can be used as a braking device acting on the shaft of the traction sheave, as part of the protection device against overspeed for the car moving in upwards direction and as a braking element against unintended car movement.
Please also observe the Annex in the EU Type Examination Certificate.
In order to guarantee the maximum braking distance while both brakes act, an inspection of the protection device including all control and brake times (detector / control / brake) is necessary.
The respective standards, regulations and directives must be observed.

Function

The ROBA-stop®-silenzio® brake is a spring applied, electromagnetic safety brake.

Spring applied function (brake):
In de-energised condition, thrust springs (9) press against the armature disks (3.1/3.2). The rotor (4.1) in brake body 1 is held between the armature disk (3.1) and the machine wall via frictional locking.
The rotor (4.2) in brake body 2 is held between the armature disk (3.2) and brake body 1 via frictional locking.
The braking torque is introduced into the drive line via the toothing of the rotors.

Electromagnetic function (release):
Due to the magnetic force of the coil in the coil carriers (2.1/2.2), the armature disks (3.1/3.2) are attracted against the spring pressure to the coil carriers (2.1/2.2). The brake is released and the brake rotors (4.1 and 4.2) with the toothed motor shaft can rotate freely.

Safety brakes:
The ROBA-stop®-silenzio® brakes reliably and safely in the event of a power switch-off, a power failure or an EMERGENCY STOP.

In de-energised condition, mechanical release of both brake circuits at the same time is possible on the brake with hand release.
By deflecting the hand release using the pipe (5.4) inserted into it in release direction (see Fig. 1), the armature disks (3.1/3.2) are attracted or pressed against the thrust springs (9) to the coil carriers (2.1/2.2), and the braking torque is cancelled.

DANGER

Operate the hand release carefully.
Attached loads are put into motion when the hand release is actuated.

Scope of Delivery / State of Delivery

Brake bodies 1 (dependent on Type with hand release) and 2 are pre-assembled.
The release monitoring devices (Item 6 or 8 / dependent on Type) are mounted and set manufacturer-side.
Included loose in delivery are:
- Rotors (4.1 and 4.2), each with inserted O-ring (1)
- Cap screw M16 x 150 (Item 7.1; 4 pieces)
- Cap screw M16 x 250 (Item 7.2; 4 pieces)
- Washer (Item 7.3; 8 pieces)
- Covers (Item 13; 2 pieces)

Additional equipment for design with hand release:
- Pipe (Item 5.4)
- Thrust springs (Item 5.8; 2 pieces)
- Tensile blocks (Item 5.9; 2 pieces)

Please check the scope of delivery according to the Parts List as well as the state of delivery immediately after receiving the goods.
mayr® will take no responsibility for belated complaints.
Please report transport damage immediately to the deliverer.
Please report incomplete delivery and obvious defects immediately to the manufacturer.

Adjustment

The brakes are equipped manufacturer-side with the respective springs for the braking torque stated on the Type tag (15). Adjustment is not necessary. Adaptions or modifications are not permitted as a rule. This rule also applies to the manufacturer-side adjusted noise damping. The switches are also adjusted manufacturer-side. Despite great care during the manufacturer-side adjustment, re-adjustment might be necessary after installation due to transportation and handling. Furthermore, such switches cannot be considered fail-safe. Please observe the sections Release Monitoring with Microswitch and Release Monitoring with Proximity Switch.

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Installation Conditions

- ❑ The eccentricity of the shaft end in relation to the mounting pitch circle must not exceed 0.2 mm.
- ❑ The positional tolerance of the threads for the cap screws (7.1 or 7.2) must not exceed 0.2 mm.
- ❑ The axial run-out deviation of the screw-on surface to the shaft must not exceed the permitted axial run-out tolerance of **0.063 mm** acc. DIN 42955 R.
  The reference diameter is the pitch circle diameter for securement of the brakes.
  Larger deviations can lead to a drop in torque, to continuous grinding on the rotors and to overheating.
- ❑ The toothed motor shaft must be designed to push fit acc. drawing, with a toothing DIN 5480-W90x3x30x28.
- ❑ The rotors (4.1 and 4.2) and brake surfaces must be oil and grease-free.
- ❑ A suitable counter friction surface (steel or cast iron) must be used. Sharp-edged interruptions on the friction surfaces must be avoided. Recommended surface quality in the area of the friction surface Ra = 1.6 – 3.2 µm. The mounting surface must be turned. The surface must be bare or FE-phosphated (layer thickness approx. 0.5 µm) without oil.
  If corrosion protection is applied, the device must be inspected for possible effects on the braking torque.
  In particular customer-side mounting surfaces made of grey cast iron are to be rubbed down additionally with sandpaper (grain ≈ 60 to 100).
- ❑ The toothings of the motor shaft and the rotors (4.1 and 4.2) must not be oiled or greased.
- ❑ Please abstain from using cleaning agents containing solvents, as they could affect the friction material.

Installation

1. Push rotor 1 (4.1) including the inserted O-ring (1) by hand using light pressure onto the toothed shaft (long rotor collar should be facing away from the machine wall).
   Check that the toothing moves easily.
   Do not damage the O-ring.
2. Push brake body 1 over the shaft and the rotor collar of rotor 1 (4.1) (please make sure that the fixing holes align with the threaded holes in the machine wall).
   Insert the cap screws (7.1) including washers (7.3) uniformly distributed into brake body 1 with manufacturer-side mounted and set hand release (dependent on type) and tighten them all around evenly **using a torque wrench and a tightening torque of 300 Nm**.
3. Push rotor 2 (4.2) including the inserted O-ring (1) by hand using light pressure onto the shaft, so that the friction linings of rotor 2 (4.2) lie against brake body 1 (long rotor collar should be facing the machine wall).
   Check that the toothing moves easily.
   Do not damage the O-ring.
4. Only for design with hand release:
   Push the 2 tensile blocks (5.9) for brake body 2 with the projection in the direction of the brake outer diameter and in the direction of the armature disk (3.2) (see Fig. 4) onto the 2 hexagon head screws (5.7).
5. Only for design with hand release:
   Push the 2 thrust springs (5.8) for brake body 2 onto the 2 hexagon head screws (5.7).
6. Insert the cap screws (7.2) including washers (7.3) into the bores in brake body 2, which are equipped with distance bolts (11), and then join with brake body 1 (see Fig. 2) and screw onto the machine wall. Tighten the cap screws (7.2) evenly all around **using a torque wrench and a tightening torque of 300 Nm**.
7. **Check air gaps "a" (Fig. 2)**
   The air gap 0.40 mm ≤ "a" ≤ 0.60 mm must be given.
8. **Check the hand release function.**
   Required hand release force approx. 360 N.
9. Mount the covers (13).
10. Connect the brake electrically.

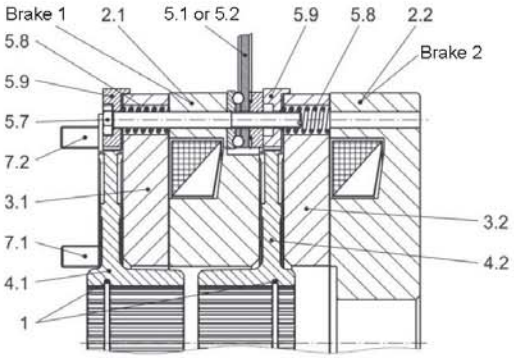

Fig. 4 (depicted without cover (13))

Noise Damping (Item 14)

The noise damping was set and adjusted manufacturer-side. However, this component is subject to ageing dependent on the application or operating conditions (torque adjustment, switching frequency, ambient conditions, system vibrations etc.).
Replacing the damping element is only permitted at the *mayr*® site of manufacture.

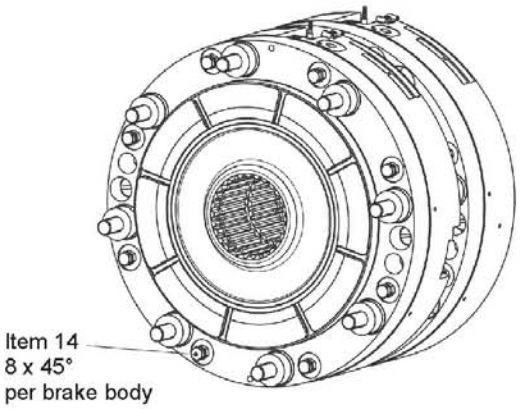

Fig. 5

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Electrical Connection and Wiring

DC current is necessary for operation of the brake. The coil voltage is indicated on the Type tag as well as on the brake body and is designed according to the DIN IEC 60038 (± 10 % tolerance). Operation must take place via DC voltage with a low ripple content, e.g. via a bridge rectifier or with another suitable DC supply. The connection possibilities can vary dependent on the brake equipment. Please follow the exact connections according to the Wiring Diagram. The manufacturer and the user must observe the applicable regulations and standards (e.g. DIN EN 60204-1 and DIN VDE 0580). Their observance must be guaranteed and double-checked!

Supply Voltage Requirements

In order to minimise noise development of the released brake, it must only be operated via DC voltage with low ripple content. AC current operation can take place using a bridge rectifier or another suitable DC power supply. Supplies whose output voltages have a high ripple content (e.g. a half-wave rectifier, a switch-mode mains adaptor, ...) are not suitable for operation of the brake.

Earthing Connection

The brake is designed for Protection Class I. This protection covers therefore not only the basic insulation, but also the connection of all conductive parts to the protective conductor (PE) on the fixed installation. If the basic insulation fails, no contact voltage will remain. Please carry out a standardised inspection of the protective conductor connections to all contactable metal parts!

Device Fuses

To protect against damage from short circuits, please add suitable device fuses to the mains cable.

Switching Behaviour

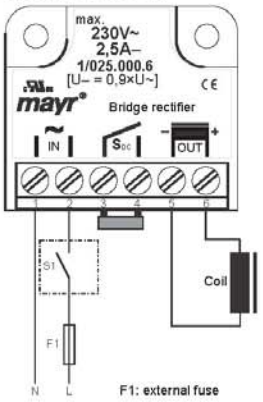
The reliable operational behaviour of a brake is to a large extent dependent on the switching mode used. Furthermore, the switching times are influenced by the temperature and the air gap between the armature disk and the coil carrier (dependent on the wear condition of the linings).

Magnetic Field Build-up

When the voltage is switched on, a magnetic field is built up in the brake coil, which attracts the armature disk to the coil carrier and releases the brake.

Magnetic Field Removal

AC-side Switching

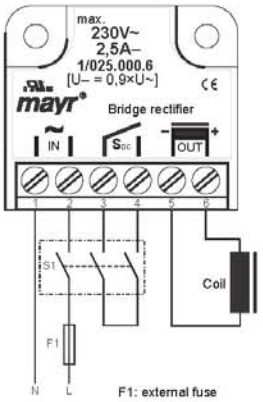


The power circuit is interrupted in front of the rectifier. The magnetic field slowly reduces. This delays the rise in braking torque.

When switching times are not important, please switch AC-side, as no protective measures are necessary for the coil and the switching contacts.

AC-side switching means **low-noise switching**; however, the brake engagement time is longer (approx. 6-10 times longer than with DC-side switching), use for non-critical braking times.

DC-side Switching



The power circuit is interrupted between the rectifier and the coil as well as mains-side. The magnetic field reduces extremely quickly. This causes a quick rise in braking torque.

When switching DC-side, high voltage peaks are produced in the coil, which lead to wear on the contacts from sparks and to destruction of the insulation.

DC-side switching means **short brake engagement times (e.g. for EMERGENCY STOP operation)**; however, louder switching noises.

Protection Circuit

When using DC-side switching, the coil must be protected by a suitable protection circuit according to VDE 0580, which is integrated in *mayr*®-rectifiers. To protect the switching contact from consumption when using DC-side switching, additional protective measures are necessary (e.g. series connection of switching contacts). The switching contacts used should have a minimum contact opening of 3 mm and should be suitable for inductive load switching. Please make sure on selection that the rated voltage and the rated operating current are sufficient. Depending on the application, the switching contact can also be protected by other protection circuits (e.g. *mayr*®-spark quenching unit, half-wave and bridge rectifiers), although this may of course then alter the switching times.

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Release Monitoring with Microswitch (6) Figs. 1 and 6

The brakes are supplied with manufacturer-side installed and adjusted release monitoring devices.
One microswitch (6.1) per brake circuit emits a signal for every brake signal condition change:
"brake opened" or "brake closed"

On initial operation:
Connection as NO contact (black and blue strands).

The customer is responsible for a signal evaluation of both conditions.

From the point at which the brake is energised, a time span of three times the separation time must pass before the switch signal on the release monitoring is evaluated.

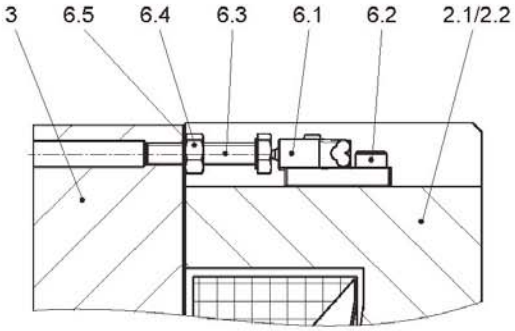
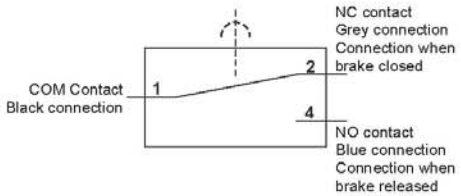


Fig. 6

Function

When the magnetic coil is energised in the coil carrier (2.1/2.2), the armature disk (3.1/3.2) is attracted to the coil carrier (2.1/2.2).
The microswitch (6.1) emits a signal, the brake is released.

Wiring Diagram per Microswitch (6.1):



Microswitch Specification

Characteristic values for measurement:	250 V~ / 3 A
Minimum switching power:	12 V, 10 mA DC-12
Recommended switching power: for maximum lifetime and reliability	24 V, 10...50 mA DC-12 DC-13 with freewheeling diode!

Usage category acc. IEC 60947-5-1:
DC-12 (resistance load), DC-13 (inductive load)

Customer-side Inspection after Attachment

The customer-side contact is an NO contact.
Please inspect the release monitoring units:

Brake de-energised → Signal "OFF",
Brake energised → Signal "ON"

Microswitches cannot be guaranteed fail-safe. Therefore, please ensure appropriate access for replacement or adjustment.
The switching contacts are designed so that they can be used for both small switching powers and medium ones. However, after switching a medium switching power, small switching powers are no longer reliably possible. In order to switch inductive, capacitive and non-linear loads, please use the appropriate protection circuit to protect against electric arcs and unpermitted loads!

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Release Monitoring with Proximity Switch (Item 8 / Figs. 1 and 7)

The brakes are supplied with manufacturer-side installed and adjusted release monitoring devices.
One proximity switch (8.1) per brake circuit emits a signal for every brake signal condition change:
"brake opened" or "brake closed".

The customer is responsible for a signal evaluation of both conditions.

From the point at which the brake is energised, a time span of three times the separation time must pass before the switch signal on the release monitoring is evaluated.

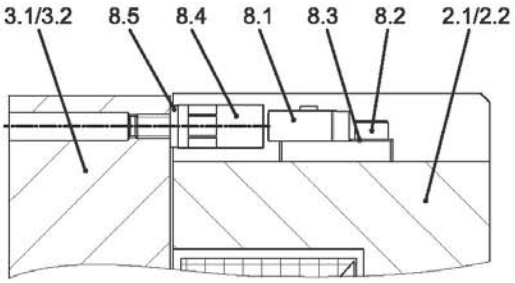


Fig. 7

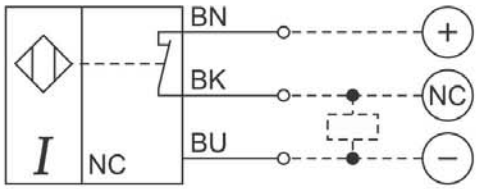
Technical Data

Output function	3-wire, PNP NC contact
Switching distance s_n	0.7 mm
Installation	flush
Assured switching distance s_a	0.7 ... 1.0 mm
Rated operating voltage U_B	10 ... 30 VDC
Switching frequency f	≤ 2 kHz
Hysteresis H	1 ... 4 %
Reverse voltage protection	protected against reverse voltage
Short-circuit protection	synchronising
Line voltage drop U_d	≤ 1.8 V
Rated operating current I_B	≤ 150 mA
Residual current I_r	≤ 0.1 mA
No-load current I_0	≤ 15 mA
Ambient temperature	-25 ... +85 °C
Connection	cable
Cable quality	3 mm, Lif12Y33Y, TPE, 1 m
Cable cross-section	3 x 0.14 mm²
Housing material	plastic, PP GR-20
Protection	IP67

Function

When the magnetic coil is energised in the coil carrier (2.1/2.2), the armature disk (3.1/3.2) is attracted to the coil carrier (2.1/2.2). The proximity switch (8.1) emits a signal, the brake is released.

Proximity Switch (8.1) Wiring Diagram:



Customer-side Inspection after Attachment

Please inspect the release monitoring units:
Brake de-energised ➔ Signal "ON",
Brake energised ➔ Signal "OFF"

Proximity switches cannot be guaranteed fail-safe. Therefore, please ensure appropriate access for replacement or adjustment.

The following prevent actuation of the proximity switch (8.1) and lead to a malfunction.

- ❑ Heavy contamination between the armature disk (3.1/3.2) and the coil carrier (2.1/2.2).
- ❑ Extreme warping on the armature disk (3.1/3.2).
- ❑ Excessively large air gap "a" between the armature disk (3.1/3.2) and the coil carrier (2.1/2.2) due to wear on the friction linings.
- ❑ Defective brake magnetic coil.
- ❑ No or incorrect voltage on the brake coil.

If none of these error sources prove to be the reason for incorrect release monitoring function, the proximity switch (8.1) must be checked and the adjustment corrected if necessary.

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Braking Torque

The (nominal) braking torque is the torque effective in the shaft train on slipping brakes, with a sliding speed of 1 m/s referring to the mean friction radius.
The brake is loaded statically when used as a service brake and loaded dynamically in EMERGENCY STOP operation (part of the brake equipment against overspeed or inadvertent movement of the elevator cage). Respectively, there are different speed values for the friction material, which in practice also leads to different friction values and therefore braking torques. Amongst other things, the braking torque is dependent on the respective quality / condition of the friction surfaces (conditioning). Therefore, bedding in of the brake linings on newly installed brakes or on rotor replacement when mounted onto the motor is required, taking into account the permitted loads. The following applies as a reference value for the bedding in of new brake linings. The load in new condition may not be more than 50 % of the max. friction work per individual circuit, acc. Technical Data. This process is to be carried out at reduced speed, approx. 30 % of the operating speed.
If the bedding in should take place under works-specific conditions, we ask you to contact us, so that we can provide the appropriate parameters.
Friction materials develop their optimum effect only under speed at the appropriate contact pressure, as continuous regeneration of the friction surface then takes place (torque consistency). Permanent grinding of the rotor can lead to overheating / damage to the brake linings, and therefore to a drop in braking torque.
Furthermore, friction materials are subject to ageing, which is also influenced, among other things, by higher temperatures and other ambient influences. We recommend regular inspection of the braking torque (1 x per year) including the respective dynamic braking actions as a refresher.

Brake Inspection (before brake initial operation)

- ❑ **Air gaps inspection (Fig. 2):**
  Air gaps "a" of both brake circuits (brake de-energised):
  Air gap: 0.40 mm ≤ "a" ≤ 0.60 mm
- ❑ **Braking torque inspection:**
  Please compare the requested braking torque with the torque stated on the Type tag.
- ❑ **Release function inspection:**
  By energising the brake via battery operation, to guarantee emergency escape for passengers during a power failure or manually using the hand release (dependent on Type).
- ❑ **Switch function inspection of the release monitoring with microswitch (NO contact)**
  Brake de-energised → Signal "OFF"
  Brake energised → Signal "ON"
  with proximity switch (NC contact)
  Brake de-energised → Signal "ON"
  Brake energised → Signal "OFF"
- ❑ **Hand release functional inspection (dependent on Type)**

Dual Circuit Brake Functional Inspection

The ROBA-stop®-silenzio® brake is equipped with a double safety (redundant) braking system.
This means that, should one brake circuit fail, the braking effect is still maintained.

DANGER

Should the elevator begin to move after release of one brake circuit or should it fail to react to the braking procedure, the energised coil must be switched off immediately!
The dual circuit braking function is not guaranteed.
Shut down the elevator, lower and secure the load, remove and inspect the brake.
Please observe the installation guidelines of the elevator manufacturer as well as the accident prevention regulations.

The individual circuit inspection is carried out by energising the individual circuits. The braking effect sufficient for the retardation of the elevator cage, which is loaded with nominal load and moving downwards at nominal speed, must be maintained (please observe the Permitted Friction Work acc. Diagram on page 9).

Inspection brake circuit 1:

1. Energise brake circuits 1 and 2 and put the system into operation.
2. De-energise brake circuit 1 (= EMERGENCY STOP) and inspect the stopping distance according to the elevator regulations.
3. De-energise brake circuit 2.

Inspection brake circuit 2:

1. Energise brake circuits 1 and 2 and put the system into operation.
2. De-energise brake circuit 2 (= EMERGENCY STOP) and inspect the stopping distance according to the elevator regulations.
3. De-energise brake circuit 1.

Inspection of both brake circuits:

Energise both brake circuits and put the drive into operation. Trigger an EMERGENCY STOP and inspect the stopping distance. The stopping distance must be much shorter than the stopping distance for an individual circuit.
If the brake is used as part of the protection device against unintended car movement, the functionality of the protection device must be verified using the type examination (compliance of the entire concept - detector/control/brake element - for the elevator system).
The inspection proves that the brake element (both brake circuits work together) releases correctly. Furthermore, it must be confirmed that the travelled distance does not exceed the stated value.
If the brake is normally released using overexcitation, brake release during the inspection must be carried out via DC-side switch-off from the overexcitation voltage.

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Installation and Operational Instructions for ROBA-stop®-silenzio® Type 896.30_.3 Size 1300

(E079 13 014 006 4 EN)

Maintenance

ROBA-stop®-silenzio® brakes are mainly maintenance-free. The friction lining pairing is robust and wear-resistant. This ensures a particularly long service lifetime of the brake. However, the friction lining is subject to operational wear on frequent EMERGENCY STOP braking actions. Normally, such occurrences are recorded and saved by the elevator control, or they require the intervention of qualified personnel. When carrying out this maintenance work (especially when taking DIN EN 13015 Appendix A into account), the causes of the malfunction must be determined, assessed and removed by specialist personnel. Causal events such as the air gap can be checked and respective measures can be taken.

The brakes on the elevator system must be maintained and repaired by a **specialist employee**, taking into consideration the type and intensity of use of the system.
The following inspections / tests are to be conducted within the scope of the defined elevator maintenance interval during maintenance and repairs.

1. Visual inspection
   - ➢ Inspection of condition in accordance with the regulations
   - ➢ Brake rotors: in particular the exterior appearance of the brake surfaces
     - wear
     - free of oil / lubricants
     - sticking of linings
2. Tightening torque inspection of the fixing screws on the brakes. If the brake fixing screws are covered with sealing lacquer, a visual inspection for damage of the sealing is sufficient.
3. Inspection of the air gap – braked (both brake circuits).
4. Inspection of toothing backlash from the splined motor shaft to the rotors (4.1 and 4.2). Max. permitted toothing backlash 0.3°.
5. Running noise (brake rotors) during operation
   Attention: Permanent grinding of the rotors can lead to overheating / damage to the brake linings, and therefore to a drop in braking torque. If such indications are present, it is essential that the braking torque is checked and the rotors replaced if required independent of the inspection or the determined wear value!
6. Braking torque or delay inspection (individual brake circuits) at least once per year (within the scope of the maintenance / main inspection)

In order to inspect the wear condition of the rotors (4.1 and 4.2), please measure the air gap "a", see Fig. 2.
If the brake limit air gap (0.9 mm) has been reached, meaning that the friction linings are worn down, the braking torque is lost and the rotors (4.1 and 4.2) must be replaced.
Brake de-installation is carried out by following the instructions in the section Installation (page 11) backwards.

Before Replacing the Rotors

- ❑ Cleaning of the brake.

Please observe the "Cleaning the Brake" section, see below.

- ❑ Measure the rotor thickness "new condition" (nominal dimension acc. Technical Data).

Replacing the Rotors (4.1 and 4.2)

Rotor (4.1 and 4.2) replacement is carried out by following the Installation section (page 11) backwards.

DANGER

The drive-brake must be load-free on hoist drives.
Otherwise there is a danger of load crashes!

Information on the Components

The **friction material** contains different inorganic and organic compounds, which are integrated into a system of hardened binding agents and fibres.

Possible hazards:
No potential dangers have been recognised so far when the brake is used according to its intended purpose. When grinding in the friction linings (new condition) and also in case of EMERGENCY STOP braking actions, functional wear can occur (wear on the friction linings); on open brake designs, fine dust can be emitted.

Classification: Hazardous property
Attention: H-classification: H372

Protective measures and rules of behaviour:
Do not inhale dusts
Vacuum the dusts at the point of origin (tested suction devices, tested filters acc. DIN EN 60335-2-69 for dust classes H; maintenance of the suction devices and filter replacement at regular intervals).
If local dust suction is not possible or is insufficient, the entire work area must be ventilated using appropriate technology.

Additional information:
This friction lining (asbestos free) is not a dangerous product in terms of the EU Directive

Cleaning the Brake

Do not clean the brake using compressed air, brushes or similar devices!

- ❒ Use a suction system or wet towels to clean off the brake dust.
- ❒ Do not inhale brake dust (wear safety gloves / safety goggles)
- ❒ In case of dust formation, a dust mask FFP 2 is recommended.

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Installation and Operational Instructions for ROBA-stop®-silenzio® Type 896.30_.3 Size 1300

(E079 13 014 006 4 EN)

Disposal

Our electromagnetic brake components must be disposed of separately as they consist of different materials. Please also observe the relevant authority regulations. Code numbers may vary according to the disassembling process (metal, plastic and cables).

Electronic components
(Rectifier / Microswitch):
Products which have not been disassembled can be disposed of under Code No. 160214 (mixed materials) or components under Code No. 160216, or can be disposed of by a certified disposal firm.

Brake bodies made of steel with coil/cable and all other steel components:
Steel scrap (Code No. 160117)

All aluminium components:
Non-ferrous metals (Code No. 160118)

Brake rotor (steel or aluminium pads with friction linings):
Brake linings (Code No. 160112)

Seals, O-rings, V-seals, elastomers, terminal boxes (PVC):
Plastic (Code No. 160119)

Malfunctions / Breakdowns:

Malfunction	Possible Causes	Solutions
Brake does not release	❑ Incorrect voltage on rectifier ❑ Air gap too large (worn rotors) ❑ Coil interrupted	❑ Apply correct voltage ❑ Replace rotors ❑ Replace the brake
Brake engagement delayed on EMERGENCY STOP	❑ Brake is switched AC-side	❑ Switch DC-side
Release monitoring does not switch	❑ Brake does not release ❑ Defective microswitch	❑ Solution as above ❑ Replace the microswitch (manufacturer-side)

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9.4.1 Assembly and adjustment of the release monitor with microswitch

Installation and Adjustment of the Release Monitoring with Proximity Switch (NC Contact) for ROBA-stop®-silenzio® Type 896._ _ _._ _

(E079 13 014 005 4 EN)

For designs by company Ziehl-Abegg

These Additional Instructions serve only as an extension of the brake Installation and Operational Instructions. Please also observe the Safety Regulations and Protective Measures in the Installation and Operational Instructions!

Proximity Switch Assembly:

Item	Name	Pcs.
1	Proximity switch NC contact (assembly with adaptor plate and sticker Item 7)	1
2	Cap screw (self-locking)	2
3	Spacer	1
4	Switching bolt	1
5	Spring lock washer	1
6	Glass fibre insulation tube Ø4 x 35	1
7	Sticker with dimension for adjustment plate	(1)

Packed into mini grip bags with marking (sticker) featuring the Mayr article number and the Ziehl article number.

For **ROBA-stop®-silenzio®** brakes, the same assembly is required 2x (1x for each brake body).

Components:

Item	Name
A	Coil carrier assembly
B	Armature disk

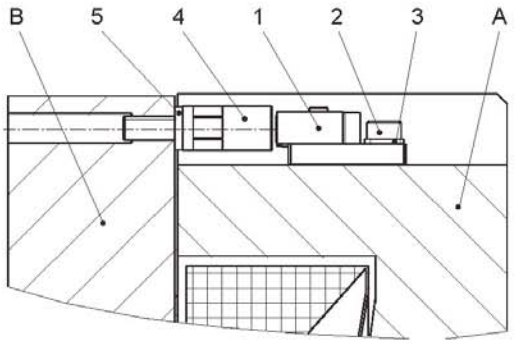

Fig. 1

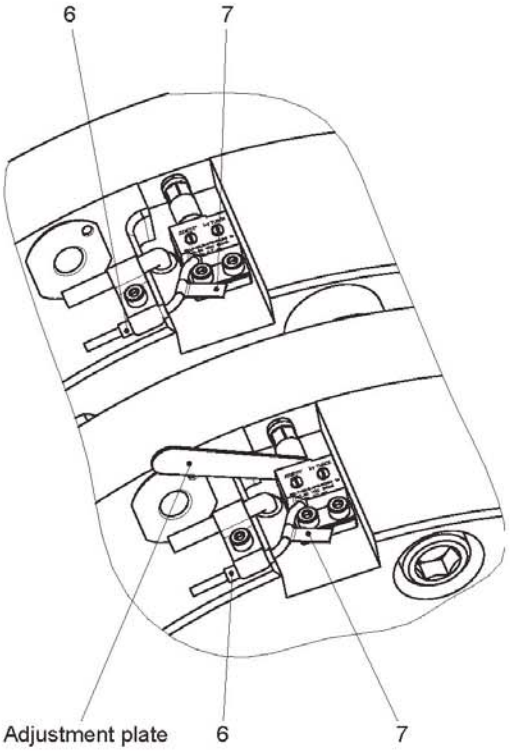

Fig. 2

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Installation and Adjustment of the Release Monitoring with Proximity Switch (NC Contact) for ROBA-stop®-silenzio® Type 896._ _ _.-_ _

(E079 13 014 005 4 EN)

ROBA-stop®-silenzio® brakes are delivered with manufacturer-side installed and adjusted release monitoring devices.
One proximity switch (1) per brake circuit emits a signal for every brake signal condition change:
"brake opened" or "brake closed"

The customer is responsible for a signal evaluation of both conditions.
From the point at which the brake is energised, a time span of three times the separation time t_2 (brake release time) must pass before the proximity switch signal on the release monitoring is evaluated.

Function

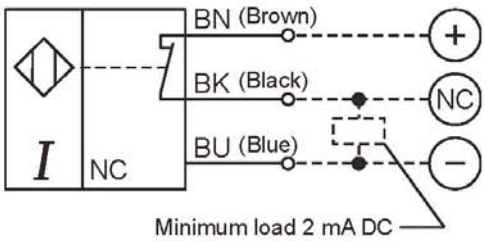
When the magnetic coil is energised in the coil carrier (A), the armature disk (B) is attracted to the coil carrier (A).
The proximity switch (1) emits a signal and the brake is released.

For brake design with hand release:
If the hand release is actuated, the switch signal of the proximity switch cannot be guaranteed.

Technical Data

Operating voltage:	10.. 30 VDC
Residual ripple content:	≤ 10 % U_{ss}
DC rated operating current: (Max. load current for continuous operation)	≤ 150 mA
No-load current I_0:	≤ 15 mA
Residual current:	≤ 0,1 mA
Rated insulation voltage:	≤ 0,5 kV
Short-circuit protection:	yes / synchronising
Line voltage drop at I_e:	≤ 1,8 V
Wire breakage protection / reverse voltage protection:	yes / completely
Output function:	3-wire, NC contact, PNP
Switching frequency:	≤ 2 kHz

Proximity Switch (1) Wiring Diagram:



Installation and Adjustment

The brake is screwed onto the machine wall using the tightening torque stated in the Installation and Operational Instructions. The brake must not be energised.

1. Determine the thread diameter of the switching bolt (4).
2. Push the spring lock washer (5) onto the thread of the switching bolt (4).
3. Screw the switching bolt (4) into the armature disk (B) using a tightening torque of 3 Nm for thread diameter M5, of 1,5 Nm for thread diameter M4.
4. Apply the proximity switch (1) assembly inc. the adaptor plate lightly using two cap screws (2) via the spacer (3) so that the proximity switch (1) can still be moved.
5. See the sticker (7) on the proximity switch cable for the dimension of the adjustment plate; join the appropriate adjustment plate between the proximity switch (1) and the switching bolt (4) (Fig. 2).

On the proximity switch cable, there is a sticker (7) stating the dimension for the required adjustment plate thickness [mm]. The adjustment plate for adjustment of the switch should consist of individual plates of a standard feeler gauge set, e.g.: 0,8 mm + 0,25 mm for a total dimension of 1,05 mm.

6. Press the proximity switch (1) **lightly and in parallel** against the adjustment plate and the switching bolt (4) and secure it using the two cap screws (2). It should still be possible to remove the adjustment plate easily; it must not jam.
   Please observe the tightening torque of 3 Nm.
7. Remove the adjustment plate.
8. Mount the glass fibre insulation tube (Item 6) via the switch cable and secure it onto the free position of a cable clamp already present.
9. Wire the proximity switch cable (1) acc. Wiring Diagram.

Customer-side Inspection after Attachment

Please inspect the release monitoring unit:
Brake de-energised → Signal "ON"
Brake energised → Signal "OFF"

Proximity switches are much more reliable than microswitches.
However, accessibility for replacement or adjustment must be provided for.

The Following Prevent Actuation of the Proximity Switch (1) and Lead to a Malfunction:

- ❑ Heavy contamination between the armature disk (B) and the coil carrier (A).
- ❑ Extreme warping on the armature disk (B)
- ❑ Excessively large air gap "a" between the armature disk (B) and the coil carrier (A) due to wear on the friction linings
- ❑ Defective brake magnetic coil.
- ❑ No or incorrect voltage on the brake coil.
- ❑ The proximity switch (1) was pressed on too strongly or was tilted during the installation procedure.

If none of these error sources prove to be the reason for incorrect release monitoring function, the proximity switch (1) must be checked and the adjustment corrected if necessary.

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9.4.2 Assembly and adjustment of the release monitor with inductive proximity switch

Installation and Adjustment of the Release Monitoring with Proximity Switch (NC Contact) for ROBA-stop®-silenzio® Type 896._ _ _._ _

(E079 13 014 005 4 EN)

For designs by company Ziehl-Abegg

These Additional Instructions serve only as an extension of the brake Installation and Operational Instructions. Please also observe the Safety Regulations and Protective Measures in the Installation and Operational Instructions!

Proximity Switch Assembly:

Item	Name	Pcs.
1	Proximity switch NC contact (assembly with adaptor plate and sticker Item 7)	1
2	Cap screw (self-locking)	2
3	Spacer	1
4	Switching bolt	1
5	Spring lock washer	1
6	Glass fibre insulation tube Ø4 x 35	1
7	Sticker with dimension for adjustment plate	(1)

Packed into mini grip bags with marking (sticker) featuring the Mayr article number and the Ziehl article number.

For **ROBA-stop®-silenzio®** brakes, the same assembly is required 2x (1x for each brake body).

Components:

Item	Name
A	Coil carrier assembly
B	Armature disk

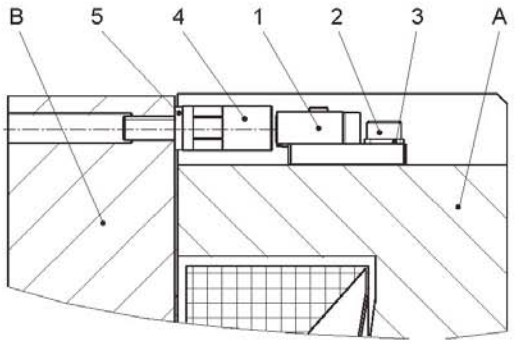

Fig. 1

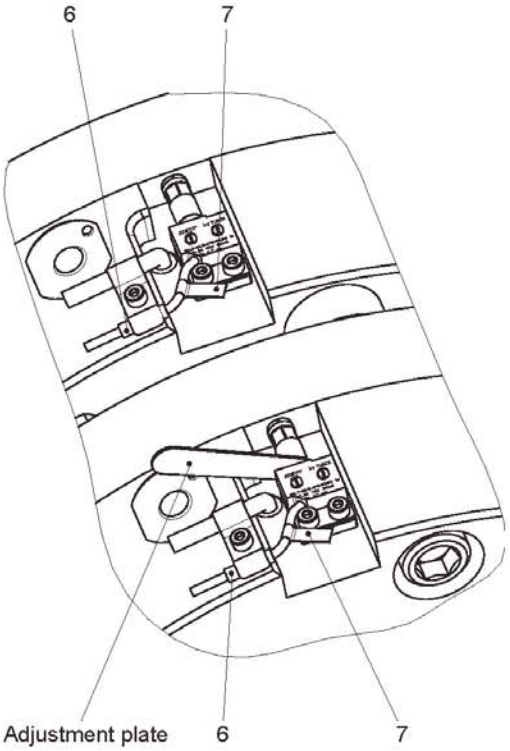

Fig. 2

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Installation and Adjustment of the Release Monitoring with Proximity Switch (NC Contact) for ROBA-stop®-silenzio® Type 896._ _ _.-_ _

(E079 13 014 005 4 EN)

ROBA-stop®-silenzio® brakes are delivered with manufacturer-side installed and adjusted release monitoring devices.
One proximity switch (1) per brake circuit emits a signal for every brake signal condition change:
"brake opened" or "brake closed"

The customer is responsible for a signal evaluation of both conditions.
From the point at which the brake is energised, a time span of three times the separation time t_2 (brake release time) must pass before the proximity switch signal on the release monitoring is evaluated.

Function

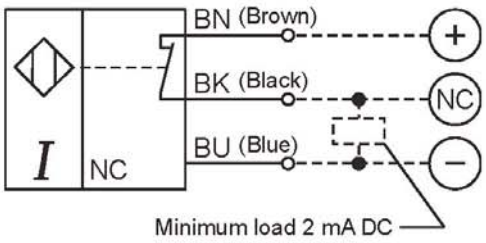
When the magnetic coil is energised in the coil carrier (A), the armature disk (B) is attracted to the coil carrier (A).
The proximity switch (1) emits a signal and the brake is released.

For brake design with hand release:
If the hand release is actuated, the switch signal of the proximity switch cannot be guaranteed.

Technical Data

Operating voltage:	10.. 30 VDC
Residual ripple content:	≤ 10 % U_{ss}
DC rated operating current: (Max. load current for continuous operation)	≤ 150 mA
No-load current I_0:	≤ 15 mA
Residual current:	≤ 0,1 mA
Rated insulation voltage:	≤ 0,5 kV
Short-circuit protection:	yes / synchronising
Line voltage drop at I_e:	≤ 1,8 V
Wire breakage protection / reverse voltage protection:	yes / completely
Output function:	3-wire, NC contact, PNP
Switching frequency:	≤ 2 kHz

Proximity Switch (1) Wiring Diagram:



Installation and Adjustment

The brake is screwed onto the machine wall using the tightening torque stated in the Installation and Operational Instructions. The brake must not be energised.

1. Determine the thread diameter of the switching bolt (4).
2. Push the spring lock washer (5) onto the thread of the switching bolt (4).
3. Screw the switching bolt (4) into the armature disk (B) using a tightening torque of 3 Nm for thread diameter M5, of 1,5 Nm for thread diameter M4.
4. Apply the proximity switch (1) assembly inc. the adaptor plate lightly using two cap screws (2) via the spacer (3) so that the proximity switch (1) can still be moved.
5. See the sticker (7) on the proximity switch cable for the dimension of the adjustment plate; join the appropriate adjustment plate between the proximity switch (1) and the switching bolt (4) (Fig. 2).

On the proximity switch cable, there is a sticker (7) stating the dimension for the required adjustment plate thickness [mm]. The adjustment plate for adjustment of the switch should consist of individual plates of a standard feeler gauge set, e.g.: 0,8 mm + 0,25 mm for a total dimension of 1,05 mm.

6. Press the proximity switch (1) **lightly and in parallel** against the adjustment plate and the switching bolt (4) and secure it using the two cap screws (2). It should still be possible to remove the adjustment plate easily; it must not jam.
   Please observe the tightening torque of 3 Nm.
7. Remove the adjustment plate.
8. Mount the glass fibre insulation tube (Item 6) via the switch cable and secure it onto the free position of a cable clamp already present.
9. Wire the proximity switch cable (1) acc. Wiring Diagram.

Customer-side Inspection after Attachment

Please inspect the release monitoring unit:
Brake de-energised → Signal "ON"
Brake energised → Signal "OFF"

Proximity switches are much more reliable than microswitches.
However, accessibility for replacement or adjustment must be provided for.

The Following Prevent Actuation of the Proximity Switch (1) and Lead to a Malfunction:

- ❑ Heavy contamination between the armature disk (B) and the coil carrier (A).
- ❑ Extreme warping on the armature disk (B)
- ❑ Excessively large air gap "a" between the armature disk (B) and the coil carrier (A) due to wear on the friction linings
- ❑ Defective brake magnetic coil.
- ❑ No or incorrect voltage on the brake coil.
- ❑ The proximity switch (1) was pressed on too strongly or was tilted during the installation procedure.

If none of these error sources prove to be the reason for incorrect release monitoring function, the proximity switch (1) must be checked and the adjustment corrected if necessary.

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9.5 EU Declaration of Conformity for Brake

mayr® Antriebstechnik

EU – Konformitätserklärung
EU – Declaration of conformity
Déclaration de conformité UE
Dichiarazione di conformità UE
Declaración de conformidad de la UE
Declaração de conformidade da UE

Im Sinne der Richtlinie Aufzüge 2014/33/EU erklären wir
In terms of the Directive 2014/33/EU relating to lifts, we
Conformément à la directive 2014/33/UE sur les ascenseurs, nous déclarons par la présente,
Secondo la Direttiva per ascensori 2014/33/UE, la presente
En el sentido de la Directiva 2014/33/UE sobre ascensores
Nos termos da diretiva 2014/33/UE declaramos

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dass die angeführten Produkte den Anforderungen der oben genannten EU-Richtlinie entsprechen.
declare that the listed products meet the requirements of the above mentioned EU Directive.
que les produits décrits satisfont aux exigences de la directive UE susmentionnée.
dichiara che i prodotti sotto elencati soddisfano i requisiti della suddetta Direttiva UE.
declaramos que los productos indicados arriba cumplen los requisitos de la Directiva UE.
que os produtos abaixo mencionados correspondem às exigências da diretiva UE supramencionada.

Elektromagnetische Federdruckbremse / *Electromagnetic spring applied brakes* **/ Freins électromagnétiques à ressort de pression /** *Freni elettromagnetici a molle compresse* **/ Frenos de muelles electromagnéticos /** *Freio eletromagnético de molas*

Produkt / *Product* **/ Produit /** *Prodotto* **/ Producto /** *Produto*	**Größen /** *Sizes* **/ Tailles /** *Grandezze* **/ Dimensión /** *Dimensão*	**Typen /** *Types* **/ Types /** *Serie* **/ Tipos /** *Tipos*	**ANVP**
ROBA-stop®-silenzio®	1300	896.30 _. 3 SO	1,**,***

Jahr der Herstellung:	**Siehe Typenschild am Produkt**
Year of manufacture:	*see product label*
Année de production:	**Voir l'étiquette sur le produit**
Anno di produzione:	*vedi l'etichetta sul prodotto*
Año de fabricación:	**ver placa de identificación del producto**
Ano de fabricação:	*Ver placa do produto*

Mauerstetten, gültig ab dem 20.4.2016
Ort und Datum / place and date / Lieu et date / luogo – data / fecha y lugar / Lugar e data

Dipl. Ing. (FH) / graduate engineer / Engenheiro graduado
Geschäftsführer / Managing Director / Directeur Général / Gerente / Gerente
Günther Klingler

Seite / *Page* **/ Page /** *Pagina* **/ Página /** *Página*
1 / 2

mayr® Antriebstechnik

Angewendete Normen, Vorschriften und Prüfungen (ANVP) / *Applied standards, regulations and inspections (ANVP)* **/ Normes, prescriptions et contrôles appliqués (ANVP) /** *In conformità alle direttive UE di norme, specifiche e controlli (ANVP)* **/ Normas, regulaciones e inspecciones aplicadas (ANVP) /** *Normas, regulamentações e inspeções aplicadas (ANVP)*

1	**EN 81-20:2014 / EN 81-50:2014 / EN 81-1:1998 + A3:2009**	**Sicherheitsregeln – Konstruktion u. Einbau von Aufzügen** *Safety rules – Construction and installation of lifts* **Règles de sécurité – construction et installation d'ascenseurs** *Regole di sicurezza per la costruzione e il montaggio di ascensori* **Reglas de seguridad – Construcción y montaje de ascensores** *Regras de segurança – Construção e instalação de elevadores*	**2014/33/EU** *2014/33/EU* **2014/33/UE** *2014/33/UE* **2014/33/UE** *2014/33/UE*

Zertifizierungsstelle für Aufzüge und Sicherheitsbauteile, Überwachung gemäß Aufzugsrichtlinie:
Certification body for lifts and safety components, monitoring of production acc. lifts directive:
Organisme de certification pour ascenseurs et composants de sécurité, contrôle de production selon la directive sur les ascenseurs:
Organismo di certificazione per ascensori e componenti di sicurezza, controllo di produzione secondo la Direttiva per ascensori :
Centro de certificación para ascensores y componentes de seguridad, supervisión según la directiva de ascensores:
Centro de certificação para elevadores e componentes de segurança, monitoramento conforme a diretiva para elevadores:

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Kennnummer 0036 / *Identification number 0036* **/ Numéro d'identification 0036 /** *Numero d'identificazione 0036* **/ Número de identificación 0036 /** *Número de identificação 0036 /*

Sicherheitsfunktion / *Safety function* **/ Fonction de sécurité /** *Funzione di sicurezza* **/ Función de seguridad /** *Função de segurança*

Bremseinrichtung, als Teil der Schutzeinrichtung für den aufwärtsfahrenden Fahrkorb gegen Übergeschwindigkeit und Bremselement gegen unbeabsichtigte Bewegung des Fahrkorbs.
Braking device as part of the protection device against over speed for the car moving in upwards direction and braking element against unintended car movement.
Dispositif de freinage faisant partie d'un système de protection contre la survitesse en montée de la cabine d'ascenseur et élément de freinage contre le déplacement involontaire de la cabine d'ascenseur.
Dispositivo di frenatura come parte del dispositivo di protezione contro la fuga verso l'alto della cabina e elemento di frenatura contro i movimenti incontrollati della cabina.
Dispositivo de frenado como parte de un dispositivo de seguridad contra la sobrevelocidad de la cabina en movimiento ascendente y como elemento de frenado contra movimientos incontrolados de la cabina.
Dispositivo de freio para ser usado como parte da unidade de proteção para prevenir excesso de velocidade da cabine elevadora em movimento ascendente e elemento de freio contra movimentos inadvertidos da cabine elevadora.

EU-Baumusterprüfbescheinigung / *EU type examination certificate* **/ Certificate d'examen de type UE /** *Certificato di omologazione UE* **/ Certificado de examen UE /** *Certificado de exame UE*

EU-BD 783

	*** EG-Maschinenrichtlinie 2006/42/EG** *** Directive 2006/42/CE sur les machines** *** Directiva de Máquinas 2006/42/CE**	** EC-Machinery directive 2006/42/EC* ** Direttiva macchine 2006/42/CE* ** Diretiva para maquinaria 2006/42/CE*
X	**** Richtlinie Niederspannung 2014/35/EU** **** Directive 2014/35/UE sur les basses tensions** **** Directivas de Baja Tensión 2014/35/UE**	*** EC-Low voltage directive 2014/35/EU* *** Direttiva per il basso voltaggio 2014/35/UE* *** Diretiva de baixa voltagem 2014/35/UE*
X	***** Elektromagnetische Verträglichkeit 2014/30/EU** ***** Directive 2014/30/UE sur la compatibilité électromagnétique** ***** Compatibilidad Electromagnética 2014/30/UE**	**** Electromagnetic compatibility directive 2014/30/EU* **** Direttiva per la compatibilità elettromagnetica 2014/30/UE* **** Diretiva de compatibilidade eletromagnética 2014/30/UE*

Mauerstetten, gültig ab dem 20.4.2016
Ort und Datum / place and date / Lieu et date / luogo – data / fecha y lugar / Lugar e data

Dipl. Ing. (FH) / graduate engineer / Engenheiro graduado
Geschäftsführer / Managing Director / Directeur Général / Gerente / Gerente
Günther Klingler

9.6 EU Type Examination Certificate

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

Industrie Service

EU TYPE-EXAMINATION CERTIFICATE

According to Annex IV, Part A of 2014/33/EU Directive

Certificate No.:	EU-BD 783
Certification Body of the Notified Body:	TÜV SÜD Industrie Service GmbH Westendstr. 199 80686 Munich - Germany Identification No. 0036
Certificate Holder:	Chr. Mayr GmbH & Co. KG Eichenstr. 1 87665 Mauerstetten - Germany
Manufacturer of the Test Sample: (Manufacturer of Serial Production – see Enclosure)	Chr. Mayr GmbH & Co. KG Eichenstr. 1 87665 Mauerstetten - Germany
Product:	Braking device acting on the shaft of the traction sheave, as part of the protection device against overspeed for the car moving in upwards direction and braking element against unintended car movement
Type:	RSO 1300/896.30_.3 SO
Directive:	2014/33/EU
Reference Standards:	EN 81-20:2014 EN 81-50:2014 EN 81-1:1998+A3:2009
Test Report:	EU-BD 783 of 2015-09-30
Outcome:	The safety component conforms to the essential health and safety requirements of the mentioned Directive as long as the requirements of the annex of this certificate are kept.
Date of Issue:	2015-09-30
Date of Validity:	from 2016-04-20

TÜV SÜD Industrie Service GmbH 00 36 Notified Body

Achim Janocha
Certification Body "lifts and cranes"

TÜV®

Annex to the EC Type-Examination Certificate No. EU-BD 783 of 2015-09-30

Industrie Service

1 Scope of application

1.1 Use as braking device – part of the the protection device against overspeed for the car moving in upwards direction – permissible brake torque and tripping rotary speed

1.1.1 Permissible brake torque when the braking device acts on the shaft of the traction sheave while the car is moving upward 4400 Nm

1.1.2 Maximum tripping speed of the overspeed governor and maximum rated speed of the lift

The maximum tripping speed of the overspeed governor and the maximum rated speed of the lift must be calculated on the basis of the traction sheave's maximum tripping rotary speed as outlined below taking into account traction sheave diameter and car suspension.

$$v = \frac{D_{TS} \times \pi \times n}{60 \times i}$$

v = Tripping (rated) speed (m/s)
D_{TS} = Diameter of the traction sheave from rope's center to rope's center (m)
π = 3,14
n = Rotary speed (rpm)
i = Ratio of the car suspension

Maximum tripping rotary speed of the traction sheave 460 rpm

1.2 Use as braking element – part of the protection device against unintended car movement (acting in up and down direction) – permissible brake torque, tripping rotary speed and characteristics

1.2.1 Nominal brake torque and response times with relation to a brand-new brake element

Size	Nominal brake torque* [Nm]	Maximum response times** [ms] parallel without Overexcitation / serial with Overexcitation		
		t_0	t_{50}	t_{90}
1300	2 x 2200 = 4400	85 / 85	150 / 150	200 / 240

Explanations:

* **Nominal brake torque:** Brake torque assured for installation operation by the safety component manufacturer.

** **Response times:** t_x time difference between the drop of the braking power until establishing X% of the nominal brake torque, t_{50} optionally calculated $t_{50}= (t_{10}+ t_{90})/2$ or value taken from the examination recording

1.2.2 Assigned execution features

Type of powering / deactivation	continuous current / continuous current end
Brake control	parallel or serial
Nominal air gap	0.45 mm
Damping elements	YES
Overexcitation	at double non-release voltage
Maximum tripping rotary speed of the traction sheave	460 rpm

Note: The English text is a translation of the German original. In case of any discrepancy, the German version is valid only.

Annex to the EC Type-Examination Certificate No. EU-BD 783 of 2015-09-30

Industrie Service

2 Conditions

2.1 Above mentioned safety component represents only a part at the protection device against overspeed for the car moving in upwards direction and unintended car movement. Only in combination with a detecting and triggering component in accordance with the standard (two separate components also possible), which must be subjected to an own type-examination, can the system created fulfil the requirements for a protection device.

2.2 The installer of a lift must create an examination instruction to fulfil the overall concept, add it to the lift documentation and provide any necessary tools or measuring devices, which allow a safe examination (e. g. with closed shaft doors).

2.3 The manufacturer of the drive unit must provide calculation evidence that the connection traction sheave – shaft – brake disc and the shaft itself is sufficiently safe, if the brake disc is not a direct component of the traction sheave (e. g. casted on). The shaft itself has to be statically supported in two points.

The calculation evidence must be enclosed with the technical documentation of the lift.

2.4 The setting of the brake torque has to be secured against unauthorized adjustment (e. g. sealing lacquer).

2.5 The identification drawing no. E07913014000161 including stamp dated 2015-09-30 shall be included to the EU type-examination for the identification and information of the general construction and operation and distinctness of the approved type.

2.6 The EU type-examination certificate may only be used in combination with the corresponding annex and enclosure (List of authorized manufacturer of the serial production). The enclosure will be updated immediately after any change by the certification holder.

3 Remarks

3.1 A code number will be inserted in the blank in the type designation RSO 1300/896.30_.3 SO according to the design (3 with hand release, 2 without hand release).

3.2 In the scope of this type-examination it was found out, that the brake device also functions as a brake for normal operation, is designed as a redundant system and therefore meets the requirements to be used also as a part of the protection device against overspeed for the car moving in upwards direction and as braking element as part of the protection device against unintended car movement.

3.3 Checking whether the requirements as per section 5.9.2.2 of EN 81-20:2014 (D) have been complied with is not part of this type examination.

3.4 Other requirements of the standard, such as reduction of brake moment respectively brake force due to wear or operational caused changes of traction are not part of this type examination.

3.5 This EU type-examination certificate was issued according to the following standards:

- EN 81-1:1998 + A3:2009 (D), Annex F.7 and F.8
- EN 81-20:2014 (D), part 5.6.6.11, 5.6.7.13
- EN 81-50:2014 (D), part 5.7 and 5.8

3.6 A revision of this EU type-examination certificate is inevitable in case of changes or additions of the above mentioned standards or of changes of state of the art.

Note: The English text is a translation of the German original. In case of any discrepancy, the German version is valid only.

Page 2 of 2

Enclosure to the EU Type-Examination Certificate No. EU-BD 783 of 2015-09-30

Industrie Service

Authorised Manufacturer of Serial Production – Production Sites (valid from: 2015-09-30):

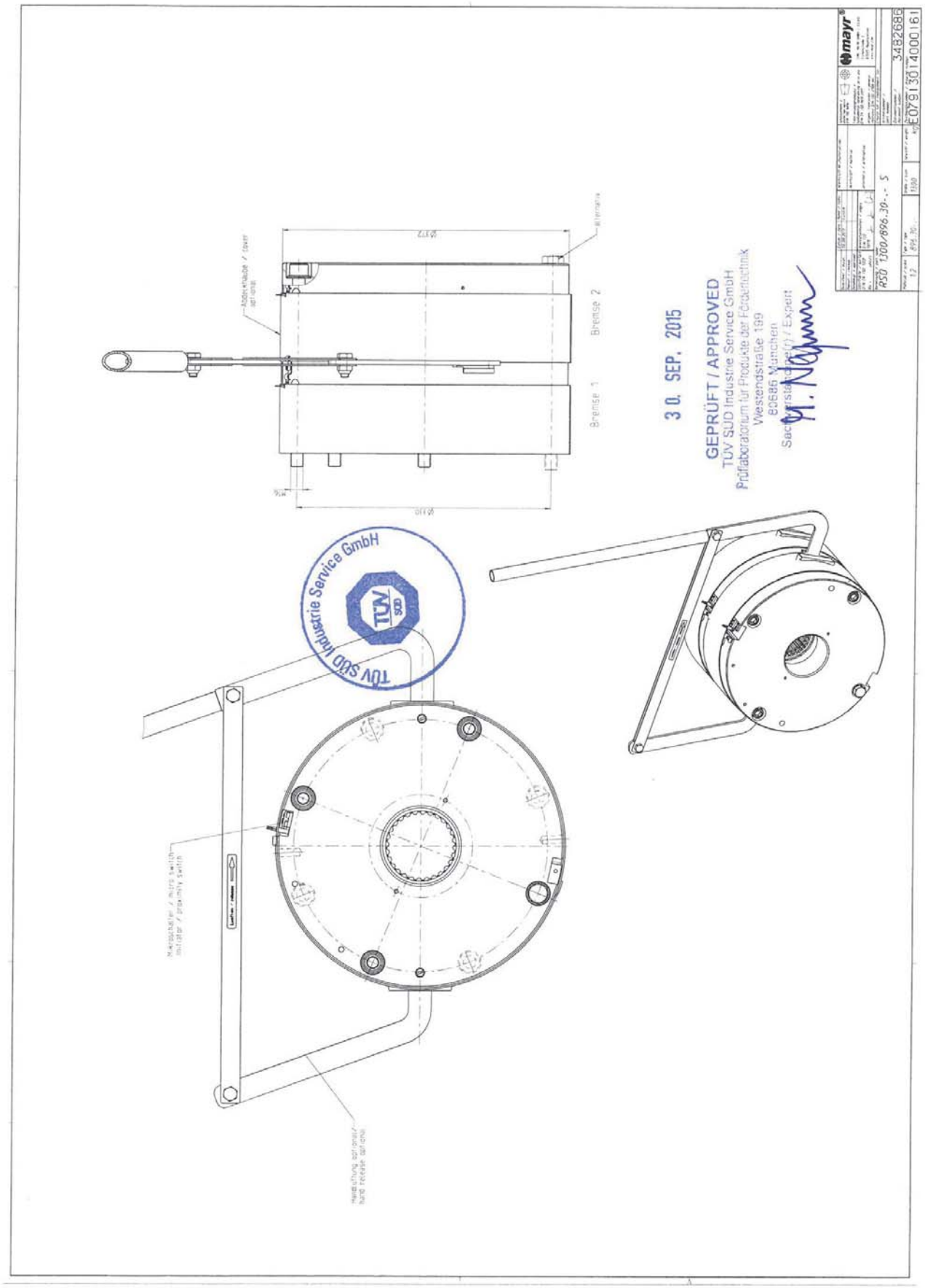
Company	Chr. Mayr GmbH & Co. KG
Address	Eichenstr. 1 87665 Mauerstetten - Germany

Company	Mayr Polska Sp. z. o. o.
Address	Rojów, ul. Hetmanska 1 63-500 Ostrzesów - Poland

- END OF DOCUMENT -

Based on: Document from Mayr GmbH of 2015-06-16

Page 1 of 1


mayr
3482686
E07913014000161
RSD 1100/896.30-.. S
Bremse 1
Bremse 2
GEPRÜFT / APPROVED
30. SEP. 2015
TÜV SÜD Industrie Service GmbH
Prüflaboratorium für Produkte der Fördertechnik
Westendstraße 199
80686 München
TÜV SÜD Industrie Service GmbH

9.6.1 Statement on type examination certificates

The rated brake torques can be found on the name plate. The switching times are assigned to the brake torque in the type examination certificate.
Increases in the index (added with "/") for a type examination certificate are only used for technical improvements and are approved by the authorised body with this condition.

9.7 Calculation of tripping speed

DTS = diameter of the traction sheave (table contains typical traction sheave diameters, other diameters can be recalculated linear)
Nbn = maximum nominal speed of the brake rotor
Nbmax = maximum trip torque of the brake rotor
Vn = maximum rated speed of the elevator
Vmax = maximum tripping speed of the elevator

Type	DTS	Nbn	Nbmax	Vn (1:1)	Vmax (1:1)	Vn (2:1)	Vmax (2:1)
	[mm]	[min^{-1}]	[min^{-1}]	[m/s]	[m/s]	[m/s]	[m/s]
SM250.60B	320	400	460	6.70	7.71	3.35	3.85
SM250.60B	400	400	460	8.83	9.63	4.19	4.82
SM250.60B	500	400	460	10.47	12.04	5.24	6.02
SM250.60B	600	400	460	12.57	14.45	6.28	7.23

Table 9-7

9.8 Calculation proof

- Translation -
(english)

A-BN18_01-GB
1836 Index 000

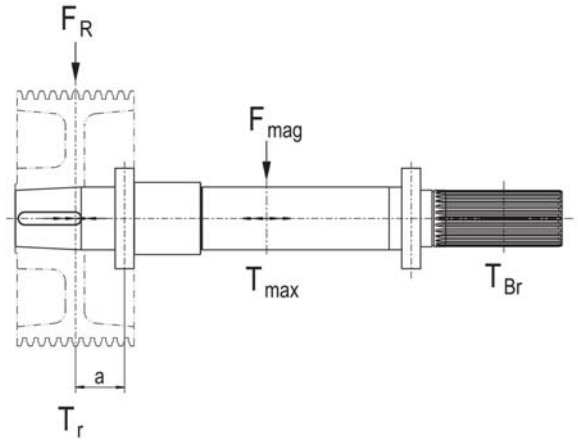
Manufacturer: ZIEHL-ABEGG SE
Heinz-Ziehl-Straße
74653 Künzelsau
Germany

Confirmation concerning the examination of traction sheave shaft calculation including shaft-hub-connections.

Type of the gearless maschine: **ZAtop SM250.60B**

Object examined: Calculation of traction sheave shaft including shaft-hub-connections by IFF ENGINEERING & CONSULTING GmbH No. 1.0.516.3 dated 18.07.2011, 4.1.506.3 dated 12.02.2014 and 8.1.532.3 dated 10.07.2018

Examination basis:	DIN 743-1:2012-12	Calculation of load capacity of shafts and axles – Part 1: General
	DIN 743-2:2012-12	Calculation of load capacity of shafts and axles – Part 2: Theoretical stress concentration factors and fatigue notch factors
	DIN 743-3:2012-12	Calculation of load capacity of shafts and axles – Part 3: Strenght of materials
	DIN 743-3 Corrigendum 1:2014-12	Calculation of load capacity of shafts and axles – Part 3: Strenght of materials, Corrigendum to DIN 743-3:2012-12
	DIN 743-4:2012-12	Calculation of load capacity of shafts and axles – Part 4: Fatique limit, endurance limit – Equivalently damaging continuous stress
	DIN 6892:2012-08	Drive type fastenings without taper action – Parallel keys – Calculation and design
	DIN 6892 Corrigendum 1:2014-05	Drive type fastenings without taper action – Parallel keys – Calculation and design, Corrigendum to DIN 6892:2012-08
	DIN 5466-1:2000-10	Splined joints, calculation of load capacity – Part 1: General basis
	FKM-Guideline 2012	Analytical strength assessment of mechanical components



Construction drawing: A-25-121-0045 index A04 dated 20.03.2018

Permissible shaft materials:
Steel DIN EN 10083-3:2007-01 – 42CrMo4+QT (1.7225+QT)
Steel DIN EN 10083-3:2007-01 – 42CrMo4+QT (1.7227+QT)
Steel DIN EN 10083-3:2007-01 – 50CrMo4+QT (1.7228+QT)

Permissible traction sheave hub materials:
Steel DIN EN 10083-2:2006-10 – C45+N (1.0503+N)
Cast iron DIN EN 1561:2012-01 – EN-GJL-300 (GG-30)

Permissible feather key traction sheave materials:
Steel DIN EN 10083-3:2007-01 – 42CrMo4+QT (1.7225+QT)

Permissible brake rotor materials:
DIN EN 1706:2013-12 AC-AlZn10Si8Mg (AC71100)
tensile strength R_{eN} = 210 N/mm^2

Load data:

Maximum permissible static operating shaft load	F_R	58.9 kN	48.5 kN	30.0 kN
Distance from bearing A to centre traction sheave	a	75 mm	95.5 mm	125 mm
Rated torque	T_r	1600 Nm		
Maximum torque	T_{max}	2400 Nm		
Magnetic force	F_{Mag}	15472 N		
Nominal brake torque	T_{Br}	4400 Nm (2 x 2200 Nm)		
Maximum brake torque	1.5 x T_{Br}	6600 Nm		
Rated speed	n_r	400 rpm		

Examination result:

For the examination a calculation of traction sheave shaft including shaft-hub-connections was carried out by IFF ENGINEERING & CONSULTING GmbH. The result was that the traction sheave and the shaft-hub-connections were designed according to the maximum load data.

An installation free of stresses and an unmovable mounting of the bearings in each direction is presupposed. The machine frame and the points of force introduction have to be designed regarding construction and strength appropriate to the forces imposed on the bearings.

It should be noted that on the brake side only braking torque is applicable, because the calculation does not take into account the additional transverse forces due to the braking effect on the traction sheave shaft.

Künzelsau, 06.09.2018
(place and date of issue)

ZIEHL-ABEGG SE
Roland Hoppenstedt
Head of R&D Drive Division
(name, function)

i.V. R. Hoppenstedt

(signature)

ZIEHL-ABEGG SE
André Lagies
Manager R&D Mechanics Drive Division
(name, function)

i.V. A. Lagies

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