

Installation and Operational Instructions for ROBA-stop®-silenzio® Type 896.2_ _._ _ Sizes 300 – 1800

(B.8.7.1.EN)

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.

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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 762



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/EU (RoHS) (Restriction on the Use of Certain Hazardous Substances, such as lead (0.1 %), mercury (0.1 %), cadmium (0.01 %), hexavalent chromium (0.1 %), polybrominated biphenyls (PBB) (0.1 %), polybrominated diphenylethers (PBDE) (0.1 %)). In addition, the product does also not contain the substances listed in the delegated Directive 2015/863 EU – 22 July 2019, Di(2-ethylhexyl)phthalate (DEHP) (0.1 %), butylbenzylphthalate (BBP) (0.1 %), dibutylphthalate (DBP) (0.1 %) and diisobutylphthalate (DIBP) (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.

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 lines 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 risk assessment required 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 directive 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 60 %. A duty cycle > 60 % leads to higher temperatures, which cause premature ageing of the noise damping and therefore lead to an increase in switching noises. Furthermore, the switch function of the release monitoring can be impaired. 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 60 %. The permitted surface temperature on the brake flange must not exceed 80 °C at a max. ambient temperature of 40 °C. For higher requirements on the friction work in case of EMERGENCY STOP or at temperatures of up to 90 °C on the brake flange, special friction materials and noise damping are to be used.
- ☐ 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.

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

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

(mechanical) IP10: Protection against large body surfaces and large foreign bodies > 50 mm in diameter. No protection against water.

(mechanical / only for design with cover, in the area of the rotors) IP20: Protection against fingers or similar-sized objects, against medium-sized foreign bodies > 12 mm in diameter. No protection against water.

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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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.

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.

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

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

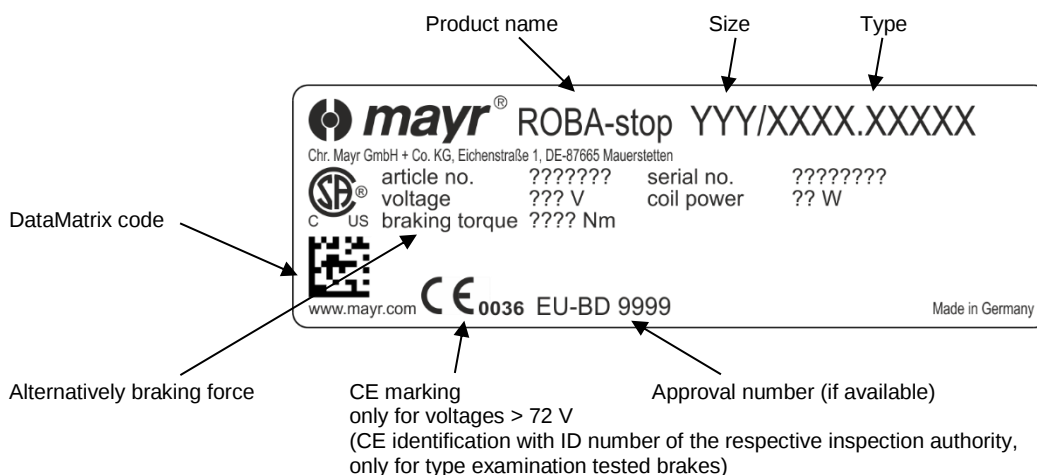
 according to the Low Voltage Directive 2014/35/EU and the Elevator Directive 2014/33/EU

Conformity Markings

 in terms of the Canadian and American approval

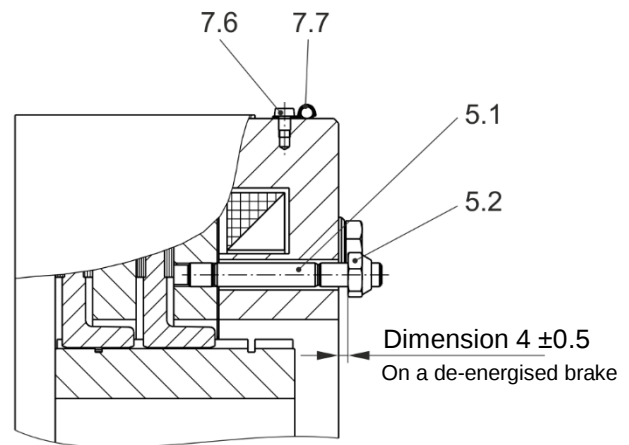
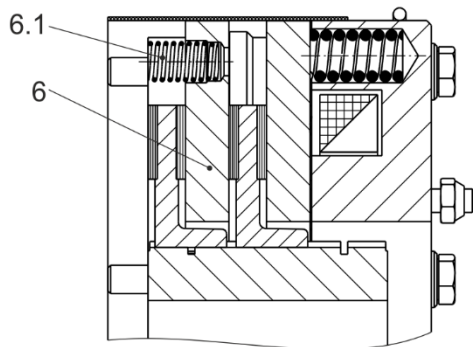
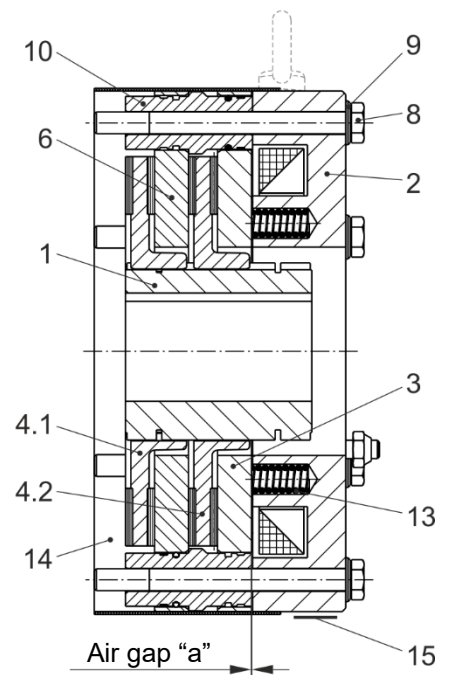
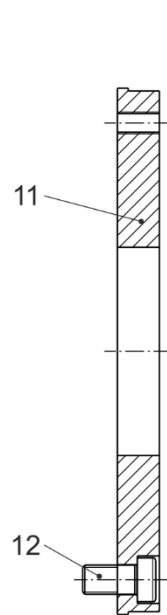
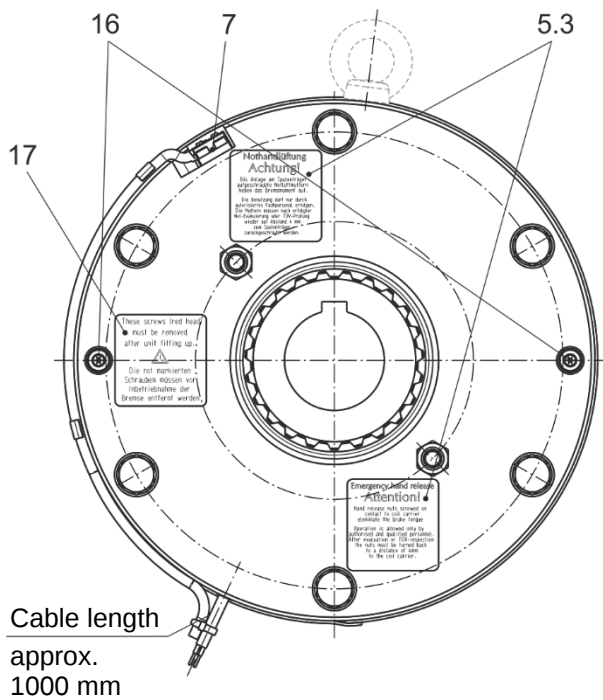
Identification

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



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Parts List (Only use mayr® original parts)

Item	Name
1	Hub
2	Coil carrier assembly
3	Armature disk
4.1	Rotor 1
4.2	Rotor 2
5	Emergency hand release assembly
5.1	Stud screw
5.2	Hexagon nut
5.3	Warning guideline sign (German and English)
6	Intermediate disk
6.1	Thrust spring
7.	Release monitoring assembly
7.1	Microswitch (Page 15 / Fig. 7)
7.2	Cap screw (Page 15 / Fig. 7)
7.3	Hexagon head screw (Page 15 / Fig. 7)
7.4	Hexagon nut (Page 15 / Fig. 7)
7.5	Spring washer (Page 15 / Fig. 7)
7.6	Cap screw
7.7	Cable clamp
7.11	Proximity switch (Page 16 / Fig. 8)
7.12	Cap screw (Page 16 / Fig. 8)
7.13	Washer (Page 16 / Fig. 8)
7.14	Switching bolt (Page 16 / Fig. 8)
7.15	Spring ring (Page 16 / Fig. 8)
8	Hexagon head screw
9	Washer
10	Distance bolt
11	Flange plate
12	Cap screw
13	Thrust spring
14	Cover
15	Type tag
16	Cap screw (not on Size 300)
17	Guideline sign (not on Size 300)

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Table 1: Technical Data (Independent of Type and Size)

Nominal voltages	24 V / 104 V / 180 V / 207 V
Protection (coil/casting compound):	IP54
Protection (mechanical): for design with cover, option Item 14	IP10 IP20
Protection (switch):	IP67
Duty cycle:	60 %
Electrical connection (coil):	2 x 0.88 mm ²
Electrical connection (microswitch):	3 x 0.5 mm ²
Electrical connection (proximity switch):	3 x 0.14 mm ²
Ambient temperature:	-5 °C to +40 °C

Table 2: Technical Data

Size	Braking torque ¹⁾ [Nm] (tolerance +60 %)			Maximum trigger speed [rpm]	Electrical nominal power [W]	Weight incl. flange plate with screws [kg]	Number of thrust springs (Item 6.1) in the intermediate disk (Item 6)
	Nominal torque 100 % Type 896.20_ _ _ _	Increased torque 120 % Type 896.21_ _ _ _	Reduced torque 75 % Type 896.22_ _ _ _				
300	600	720	450	300	86	40.5	2
500	1000	1200	760	300	90	53	3
800	1600	2000	1200	300	107	80	6
1300	2600	3120	1960	250	131	113	8
1800	3600	4300	2700	250	150	153	4



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

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.

Table 3: Technical Data

Size	Rotor thickness New condition - 0.05 [mm]	Nominal air gap "a", on a de-energised brake + 0.15 / - 0.1 [mm]	Maximum air gap ²⁾ "a" at nominal torque 100 % [mm]	Maximum air gap ²⁾ "a" at torque 75 % or 120 % ³⁾ [mm]
300	13.9	0.55	1.0	1.3
500	16	0.55	1.0	1.3
800	18	0.55	1.0	1.3
1300	18	0.70	1.1	1.5
1800	18	0.70	1.1	1.5



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.

³⁾ At a braking torque adjustment of 120 % (all construction sizes) and 100 % (for Sizes 500 and 800) overexcitation (1.5 to 2 x the nominal voltage) is required for safe and fast release.

CAUTION



On brakes with reduced braking torque or during operation with overexcitation, braking function can no longer be guaranteed when air gap > maximum air gap.

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Table 4: Fixing screws with wrench openings and tightening torques

Size	Brake			Flange plate (11)		
	Item 8	SW	Tightening torque	Item 12	SW	Tightening torque
300	3 x M12	18/19	123 Nm	6 x M12	10	123 Nm
500	6 x M12	18/19	123 Nm	6 x M16	14	200 Nm
800	6 x M16	24	250 Nm	6 x M16	14	300 Nm
1300	8 x M16	24	250 Nm	8 x M16	14	300 Nm
1800	8 x M16	24	300 Nm	8 x M20	17	470 Nm

Table 5: Switching Times for Nominal Braking Torque 100 %

Size	Attraction t_2 [ms]	Drop-out t_0 (DC) [ms]	Drop-out $t_{50}^{4)}$ (DC) [ms]	Drop-out $t_{90}^{4)}$ (DC) [ms]	Drop-out t_{11} (AC) [ms]	Drop-out $t_1^{5)}$ (AC) [ms]
300	308	63	135	183	475	1195
500	444	78	130	210	570	1250
800	581	65	135	210	590	1355
1300	589	80	155	205	650	1610
1800	850	105	188	290	880	2110



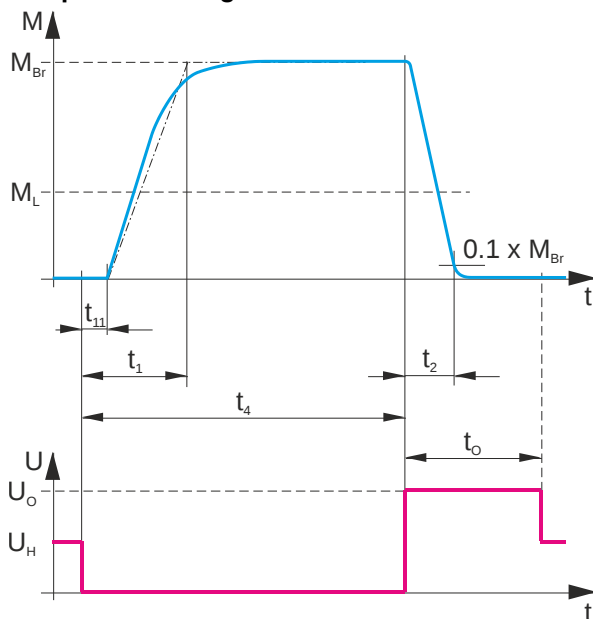
⁴⁾ Referring to the nominal braking torque

⁵⁾ Referring to the effective braking torque

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

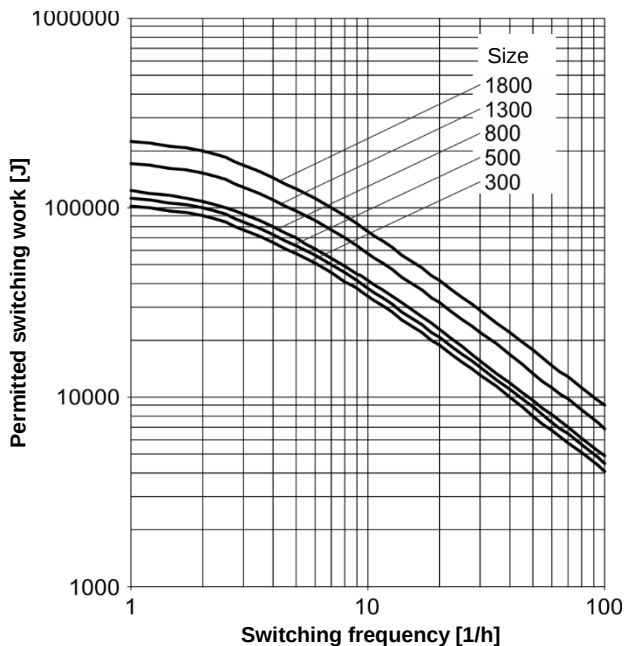
- M_{Br} = Braking torque
- M_L = Load torque
- t_1 = Connection time
- t_{11} = Response delay on connection
($\pm t_0$ acc. Type Examination Certificate)
- t_2 = Separation time
- t_4 = Slip time + t_{11}
- t_0 = Overexcitation time
- U_N = Coil nominal voltage
- U_H = Holding voltage
- U_O = Overexcitation voltage

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Friction Power Diagram

at $n = 300$ rpm for Sizes 300 to 800
at $n = 250$ rpm for Sizes 1300 to 1800



Application

- ☐ ROBA-stop®-silenzio® for use as a holding brake with occasional EMERGENCY STOP braking actions
- ☐ Horizontal brake axis
- ☐ The max. permitted speeds acc. table 2 as well as the permitted friction works acc. friction power diagram must be observed.

Design

The ROBA®-silenzio® is a spring applied, electromagnetically releasing 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 (13) press against the armature disk (3). The rotor (4.2) is held between the armature disk (3) and the intermediate disk (6), the rotor (4.1) between the intermediate disk (6) and the flange plate (11) or machine wall via frictional locking. The braking torque is introduced into the shaft via the toothing of the rotors (4.1 and 4.2) and the hub (1).

Electromagnetic function (release):

Due to the magnetic force of the coil in the coil carrier (2), the armature disk (3) is attracted against the spring pressure to the coil carrier (2) and the intermediate disk (6) is pressed against the collar of the distance bolts (10) via the thrust springs (6.1). The brake is released and the brake rotors (4.1 and 4.2) with the hub (1) can rotate freely.

Safety brake function:

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

Scope of Delivery / State of Delivery

The brakes are pre-assembled.

The release monitoring devices (7) are mounted and set manufacturer-side.

Included loose in delivery are:

Flange plate (Item 11 / option dependent on Type) with cap screws (12), hexagon head screws (8) with washers (9), cover (14), hub (1), thrust springs (6.1) and rotor (4.1).

Please check the scope of delivery as well as the state of delivery immediately after receiving the goods.

mayr® will take no responsibility for belatedly returned goods.

Please report transport damage immediately to the deliverer.

Please report incomplete delivery and obvious defects immediately to the manufacturer.



The screws (16) marked in red must be removed **before initial operation of the brake** (not for Size 300).

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 also observe the section 'Release Monitoring'.

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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 hexagon head screws (8) 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 **0.05 mm** for Size 300, and of **0.063 mm** for Sizes 500 to 1800, according to 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 tolerances of the hub (1) and the shaft must be selected so that no widening of the hub (1) toothing can occur, as widening of the toothing leads to the rotors (4.1 and 4.2) jamming on the hub (1) and therefore to brake malfunctions. (Recommended hub – shaft tolerance H7/k6).
The max. permitted joining temperature of 200 °C must not be exceeded.
- ❑ If the brake has been delivered without flange plate (11), a mounting surface geometry as described in catalogue P.896.V___.EN must be provided (respective diameter and limit stop for the cover)
- ❑ 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 $R_a = 0.8 - 1.6 \mu\text{m}$. The mounting surface must be turned. The surface must be bare or FE-phosphated (layer thickness approx. $0.5 \mu\text{m}$) 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 hub (1) 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 (Figs. 1 to 5)

1. If necessary, mount the flange plate (Item 11 / option dependent on Type) using cap screws (12) onto the mounting surface (please observe the tightening torque according to Table 4).
2. Mount the hub (1) onto the shaft, bring it into the correct position (the length of the key should lie over the entire hub) and secure it axially (e.g. using a locking ring).
3. Push the rotor (4.1) onto the hub (1) by hand (the rotor collar should be facing away from the machine wall or flange plate).
Make sure that the toothing moves easily.
4. Screw the thrust springs (6.1) anti-clockwise into the stepped bores of the intermediate disk (6) (for number of pieces, see table 2).
5. Push the brake body with the intermediate disk (6) and rotor (4.2) over the hub (1) and the rotor collar of rotor (4.1). Join the toothing carefully. Make sure that the toothing moves easily. Do not damage the toothing!
Insert the hexagon head screws (8) evenly distributed in the brake body and tighten them evenly all around **with a torque wrench to the tightening torque (acc. table 4)**.
6. Remove the screws (16) marked in red, see Fig. 1, from the brake (not for Size 300).



Attention!

The screws (16) marked in red must be removed **before initial operation of the brake** (not for Size 300).

7. **Inspect air gap "a" according to Table 3**
The nominal air gap "a" on a de-energised brake must be given.
8. If necessary, mount the cover (Item 14 / option dependent on Type).
9. Connect the brake electrically.

Noise Damping



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.

Emergency Hand Release

The brakes are equipped (dependent on Type) with an emergency hand release (5), so that the cage can be moved upwards or downwards during an emergency evacuation with the aid of the additional dual-circuit brake, or so that the torque can be set to 0 during a TÜV (German Technical Inspectorate) inspection of the additional dual-circuit brake.

For this, both hexagon nuts (5.2) must be tightened evenly against the coil carrier (2) until the armature disk (3) lies against the coil carrier (2) against the thrust spring (13) force; thereby, the braking torque is cancelled.



Before putting the elevator or the system into repeat operation start-up, the distance between both hexagon nuts (5.2) and the coil carrier (2) must be re-adjusted to 4 ± 0.5 mm (on a de-energised brake), as described on Fig. 6.

Please observe the two yellow warning guideline signs (5.3) in German and in English mounted in close proximity to the two hexagon nuts (5.2).

Nothandlüftung Achtung!

Bis Anlage am Spulenträger aufgeschraubte Notlüftmuttern heben das Bremsmoment auf. Die Benutzung darf nur durch autorisiertes Fachpersonal erfolgen. Die Mutter müssen nach erfolgter Not-Evakuierung oder TÜV-Prüfung wieder auf **Abstand 4 mm** zum Spulenträger zurückgeschraubt werden.

Emergency hand release

Attention!

Hand release nuts screwed up to the contact on the coil carrier eliminate the braking torque. Operation is allowed only by authorised and qualified personnel. After evacuation or TÜV-inspection the nuts must be turned back to a distance of 4 mm to the coil carrier.

DANGER



Should the elevator start to move when tightening the hexagon nuts (5.2), both hexagon nuts (5.2) must be turned back again immediately. In this case, the additional dual-circuit brake must be checked.

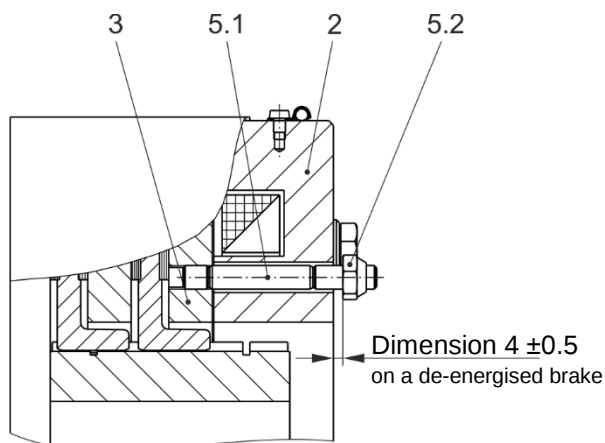


Fig. 6

Installation and Operational Instructions for ROBA-stop®-silenzio® Type 896.2 _ _ _ Sizes 300 – 1800

(B.8.7.1.EN)

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 ($\pm 10\%$ 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.

At variance with this, designs with braking torque $> 100\%$ must be operated with overexcitation.

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.

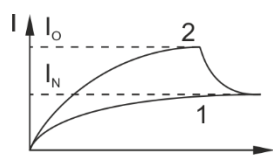
Field build-up with normal excitation

If the magnetic coil is energised with nominal voltage, the coil current does not immediately reach its nominal value. The coil inductivity causes the current to increase slowly as an exponential function. Accordingly, the build-up of the magnetic field takes place more slowly and the braking torque drop (curve 1) is also delayed.

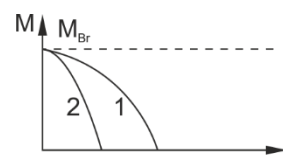
Field build-up with overexcitation

A quicker drop in braking torque is achieved if the coil is temporarily placed under a higher voltage than the nominal voltage, as the current then increases more quickly. Once the brake is released, it needs to be switched over to the nominal voltage (curve 2). The ROBA®-(multi)switch fast acting rectifier and phase demodulator work on this principle.

Current path



Braking torque path



Operation with overexcitation requires an inspection of:

- the required overexcitation time
- as well as the RMS coil capacity with a cycle frequency higher than 1 cycle per minute.

Overexcitation time t_0

Increased wear, and therefore an increasing air gap as well as coil heating lengthen the separation times t_2 for the brake. For this reason, at least double the separation time t_2 at nominal voltage must be selected as overexcitation time t_0 on each brake size (guideline value: $2 \times t_2 \leq t_0 \leq 3 \times t_2$).

The spring forces also influence the brake separation times t_2 : Higher spring forces increase the separation times t_2 and lower spring forces reduce the separation times t_2 .

➤ Spring force (braking torque adjustment) $< 100\%$:

The overexcitation time t_0 is less than the doubled separation time t_2 on each brake size.

➤ Spring force (braking torque adjustment) $= 100\%$:

The overexcitation time t_0 is the doubled separation time t_2 on each brake size.

➤ Spring force (braking torque adjustment) $> 100\%$:

The overexcitation time t_0 is higher than the doubled separation time t_2 on each brake size.

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(B.8.7.1.EN)

** RMS coil capacity P



$P \leq P_N$

The coil capacity P must not be larger than P_N . Otherwise the coil may fail due to thermal overload.

Key and Calculations:

P [W] RMS coil capacity dependent on switching frequency, overexcitation and duty cycle

$$P = \frac{P_O \times t_O + P_H \times t_H}{T}$$

P_N [W] Coil nominal capacity (catalogue values, Type tag)

P_O [W] Coil capacity on overexcitation

$$P_O = \left(\frac{U_O}{U_N} \right)^2 \times P_N$$

t_O [s] Overexcitation time

t_N [s] Time of operation with coil nominal voltage

t_{on} [s] Time with voltage

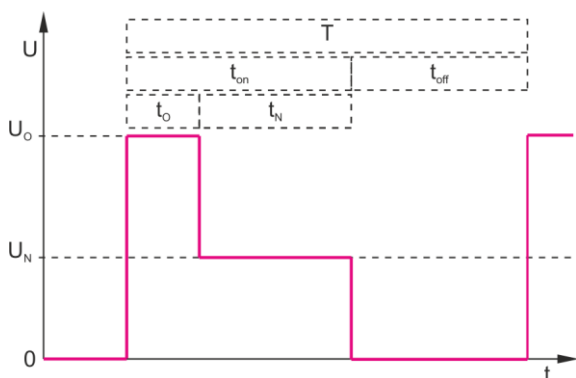
t_{off} [s] Time without voltage

T [s] Total time ($t_O + t_N + t_{off}$)

U_O [V] Overexcitation voltage (bridge voltage)

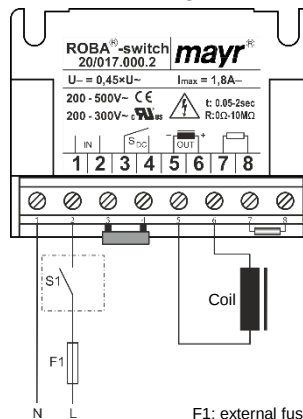
U_N [V] Coil nominal voltage

Time Diagram:



Magnetic Field Removal

AC-side switching

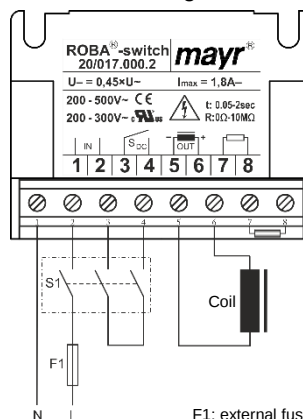


The power circuit is interrupted in front of the rectifier. The magnetic field slowly reduces. This delays the rise in braking torque.

When switching times are not important, please switch AC-side, as no protective measures are necessary for coil and 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 disconnection), 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 can 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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(B.8.7.1.EN)

Release Monitoring with Microswitch (Dependent on Type / Fig. 7)

The brakes are supplied with manufacturer-side installed and adjusted release monitoring devices.

A microswitch (7.1) emits a signal for every brake 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.

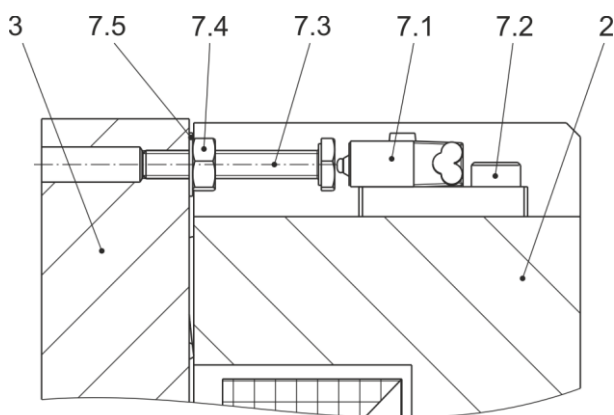


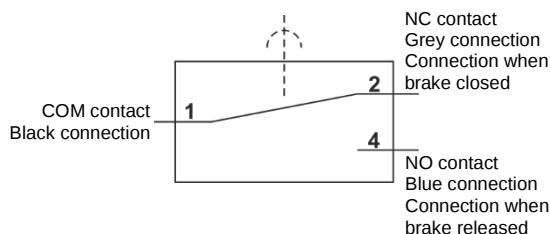
Fig. 7

Release Monitoring Function

When the magnetic coil in the coil carrier (2) is energised, the armature disk (3) is attracted to the coil carrier (2).

The microswitch (7.1) emits a signal, the brake is released.

Microswitch (7.1) Wiring Diagram:



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!

The Following Prevent Actuation of the Microswitch (7.1) and Lead to a Malfunction.

- ☐ Heavy contamination between the armature disk (3) and the coil carrier (2).
- ☐ Extreme warping on the armature disk (3).
- ☐ Excessively large air gap "a" between the armature disk (3) and the coil carrier (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 microswitch (7.1) must be checked and the adjustment corrected if necessary.

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(B.8.7.1.EN)

Release Monitoring with Proximity Switch (Dependent on Type / Fig. 8)

The brakes are supplied with manufacturer-side installed and adjusted release monitoring devices.

The proximity switch (7.11) emits a signal for every brake 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.

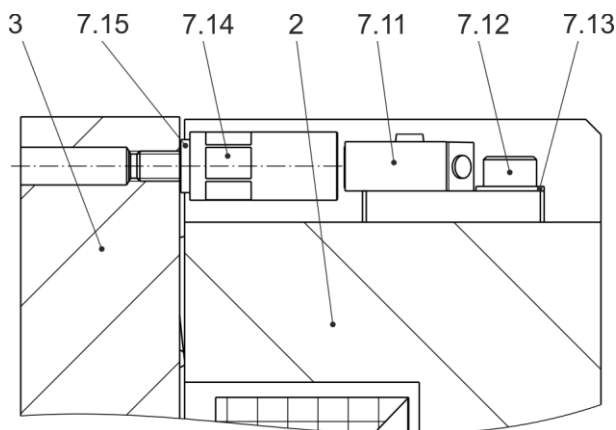


Fig. 8

Function

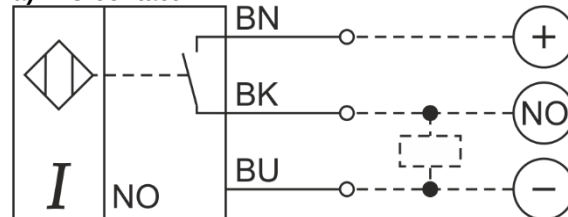
When the magnetic coil in the coil carrier (2) is energised, the armature disk (3) is attracted to the coil carrier (2). The proximity switch (7.11) emits a signal, the brake is released.

Technical Data

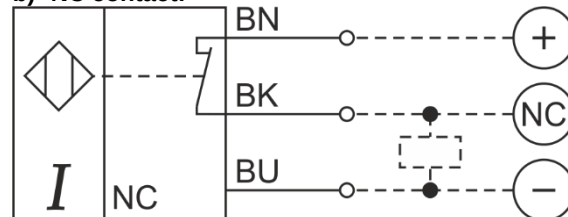
Output function	3-wire, PNP NO contact or NC contact
Switching distance s_n	0.7 mm
Installation	flush
Assured switching distance s_a	0.7 ... 1.0 mm
Rated operating voltage U_B	10 ... 30 VDC
Switching frequency f	≤ 2 kHz
Hysteresis H	1 ... 4 %
Reverse voltage protection	protected against reverse voltage
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 mm ²
Housing material	plastic, PP GR-20
Protection	IP67

Proximity Switch (7.11) Wiring Diagram:

a) NO contact:



b) NC contact:



Customer-side Inspection after Attachment

a) Proximity switch (NO contact):

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

b) Proximity switch (NC contact):

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.

Proximity switches are components according to IEC60947-5-2 and are to be used according to the standard. They are electrically specified for applications in well protected (controlled) operating environment (par. 8.2.6). The power supply must be selected accordingly. Additional measures, such as separate cable routing and shielded cables, may be necessary for EMC-compliant installation in machines and systems, especially for long cables.

The Following Prevent Actuation of the Proximity Switch (7.11) and Lead to a Malfunction:

- ☐ Heavy contamination between the armature disk (3) and the coil carrier (2).
- ☐ Extreme warping on the armature disk (3).
- ☐ Excessively large air gap "a" between the armature disk (3) and the coil carrier (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 (7.11) must be checked and the adjustment corrected if necessary.

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(B.8.7.1.EN)

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 rotors 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)

- ☐ **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 emergency hand release.
- ☐ **Air gap inspection (Fig. 2)**
Air gap "a" (brake de-energised) acc. table 3.
- ☐ **Switch function inspection of the release monitoring**
see pages 15/16 (dependent on Type)

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 hub (1) to the rotors (Items 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 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 maximum air gap (acc. Table 3) 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

- ☐ Clean the brake.



Please observe the "Cleaning the Brake" section on page 18.

- ☐ Measure the rotor thickness "new" (nominal dimension acc. Table 3).

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!

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(B.8.7.1.EN)

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

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 / Switch):

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)

Cleaning the Brake



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

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

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 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 switch	☐ Solution as above ☐ Replace the switch (manufacturer-side)
Brake does not brake	☐ The emergency hand release was actuated	☐ Turn the hexagon nuts for the emergency hand release back to the required dimension



mayr® will take no responsibility or guarantee for replacement parts and accessories which have not been delivered by mayr®, or for damage resulting from the use of these products.