Installation and Operational Instructions for ROBA-stop®-silenzio® Type 896._ _ _._ _ Sizes 4 – 1800

(B.8.7.EN)

Translation of the Original Operational Instructions

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

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

Approvals

(valid for construction sizes 200 to 1800, with microswitch / proximity switch for release monitoring)

EU Type Examination Certificate (Elevator Directive):

- EU-BD 760 for dual circuit brake
- EU-BD 761 for single circuit brake

UK Type Examination Certificate (Lifts Regulations):

- UK-BD 760 for dual circuit brake
- UK-BD 761 for single circuit brake

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Guidelines on EU Directives

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 and the RoHS 2011/65/EU with 2015/863/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 initial operation of the product until you have ensured that the machine accords with the regulations stated in the directive.

Guidelines on the EU Directive 2011/65/EU (RoHS II) with 2015/863/EU (RoHS III – from 22 July 2019)
These restrict the use of certain hazardous substances in electrical and electronic devices as well as in products / components (category 11), the proper operation of which is dependent on electric currents and electromagnetic fields.
Our electromagnetic products / components fulfill the requirements laid down in the RoHS Directive(s), taking into account the valid exceptions (according to Appendix III and IV RoHS (2011/65/EU) with delegated Directives (EU) 2018/739-741 from 01.03.2018 for Category 11 – until 21 July 2024) and comply with the RoHS.

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.

Guidelines on the REACH Regulation (EC) No. 1907/2006
of the European Parliament and of the Council concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH). This regulation governs the manufacture, placing on the market and use of chemical substances in preparations and, under certain conditions, also of substances in finished products.
mayr® power transmission exclusively manufactures products (articles: overload clutches, shaft couplings, electromagnetic brakes / clutches, permanent magnet motors and the appropriate control modules / rectifiers) in accordance with the definition in Article 3 of the REACH Regulation.
mayr® power transmission is aware of its responsibility towards the environment and society. As a matter of precaution, we pay attention to particularly critical substances in the supply chain and strive to avoid using any such substances completely or to replace them in the near future.
In compliance with Article 33 of the REACH Regulation, we would like to inform you that in our overload clutches and shaft couplings, electromagnetic brakes / clutches as well as permanent magnet motors, subcomponents with a lead content of > 0.1% are or may be used. These are manufactured from raw materials such as machining steel / copper alloys (e.g. brass, bronze) or aluminum alloys.
Besides high-melting-point (HMP) solders (electronics), this also affects integrated machine elements as well as standard parts (screws / nuts / set screws / pins / etc.) among others, provided that the relevant standards allow this.
For example, lead can occur as an alloying element with more than 0.1 mass percent, based on the respective total mass, in screws and set screws of the following property classes: 4.6, 4.8, 5.8, 6.8, 04, 4, 5, 6, 14H, 17H, 22H, 33H, 45H.
Products made from copper and copper alloys do not fall within the area of applicability of Regulation (EC) No. 1272/2008 of the European Parliament and Council on the Classification, Labeling and Packaging of Substances and Mixtures (CLP Regulation) and are therefore not subject to the classification and labeling obligations.
To our knowledge, when used for their intended purpose and disposed of correctly (recycling), the contained substances pose no threat to health or environment.
We would like to point out that the proportion of lead used here is not prohibited according to the REACH Regulation. It is merely necessary to declare the use of this substance.

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Guidelines on UK Directives / Conformity

Products / components from *mayr*® power transmission fulfill the requirements for the British economic area due to currently identical UK and EU directives.
In addition to the CE identification, the UKCA identification is attached to the product.
The UK Declaration of Conformity is available in a separate document.

Directives under EU Law	Directives under UK Law
Machinery Directive 2006/42/EC	Supply of Machinery (Safety) Regulations UK 2008 No. 1597
EMC Directive 2014/30/EU	Electromagnetic Compatibility Regulations UK 2016 No. 1091
EU Low Voltage Directive 2014/35/EU	Electrical Equipment (Safety) Regulations UK 2016 No. 1101
RoHS II 2011/65/EU	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations UK 2012 No. 3032
Elevator Directive 2014/33/EU	Lifts Regulations UK 2016 No. 1093

Guidelines on EU and UK REACH

According to the European Union (Withdrawal) Act 2018, the EU REACH Regulation was transposed into UK law on January 1, 2021, and is known as UK REACH.
REACH and related legislation have been replicated in the UK with the necessary changes to make it workable in a domestic context.
The fundamental principles of the EU REACH Regulation have been retained in UK REACH.
The remarks on the information obligation according to UK-REACH correspond in content to the REACH Regulation (EC) No. 1907/2006.

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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-energized, 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 energization 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 aging 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.

Please ensure that the brake is clean and oil-free. In particular in gear applications, special sealing measures, among other precautions, may be necessary!

- ❒ 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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Dimensioning

Attention!
When dimensioning the brake, please take into consideration that 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 brake designs **without Type Examination certificate** are suitable for applications with an ambient temperature of between -20 °C and +40 °C.

The brake designs **with Type Examination certificate** are suitable for mounting / operation on electromotive elevator machinery in enclosed places of installation 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 behavior.

Intended Use

➢ **Designs without Type Examination certificate:**

mayr®-brakes have been developed, manufactured and tested in compliance with the DIN VDE 0580 standard and in accordance with the EU Low Voltage Directive as electromagnetic components. During installation, operation and maintenance of the product, the requirements for the standard must be observed.
mayr®-brakes are for use in machines and systems and must only be used in the situations for which they are ordered and confirmed. Using them for any other purpose is not allowed.

➢ **Designs with Type Examination certificate:**

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 upward-moving car and as a braking element against inadvertent movement of the car.

Grounding 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 standardized 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) IP10 (without cover): Protection against large body surfaces and large foreign bodies > 50 mm in diameter. No protection against water.

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

(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): classes 1K21; 1Z1; 1B1; 1C2; 1S11; 1M11

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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.

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

➢ **For designs without Type Examination certificate:**

DIN VDE 0580	Electromagnetic devices and components, general specifications
DIN EN 61140	Protection against electric shock - Common aspects for installation and equipment
DIN EN IEC 63000	Technical documentation for the assessment of electrical and electronic equipment regarding the restriction of hazardous substances
DIN EN IEC 60529	Degrees of protection provided by enclosures (IP Code)
2014/35/EU	Low Voltage Directive
2011/65/EU	RoHS II - Directive
2015/863/EU	RoHS III- Directive
CSA C22.2 No. 14-2010	Industrial Control Equipment
UL 508 (Edition 17)	Industrial Control Equipment
EN ISO 12100	Safety of machinery – General principles for design - Risk assessment and risk reduction
DIN EN 61000-6-4	Interference emission
DIN EN 61000-6-2	Interference immunity

➢ **For designs with Type Examination certificate:**

DIN VDE 0580	Electromagnetic devices and components, general specifications
DIN EN 61140	Protection against electric shock - Common aspects for installation and equipment
DIN EN IEC 63000	Technical documentation for the assessment of electrical and electronic equipment regarding the restriction of hazardous substances
DIN EN IEC 60529	Degrees of protection provided by enclosures (IP Code)
2014/35/EU	Low Voltage Directive
2011/65/EU	RoHS II - Directive
2015/863/EU	RoHS III- 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	Safety regulations for theatre stage technical systems
DIN EN 17206	(previously DIN 56950-1) Entertainment technology - Lifting and load-bearing equipment for stages and other production areas in the entertainment industry - Specifications for general requirements
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!

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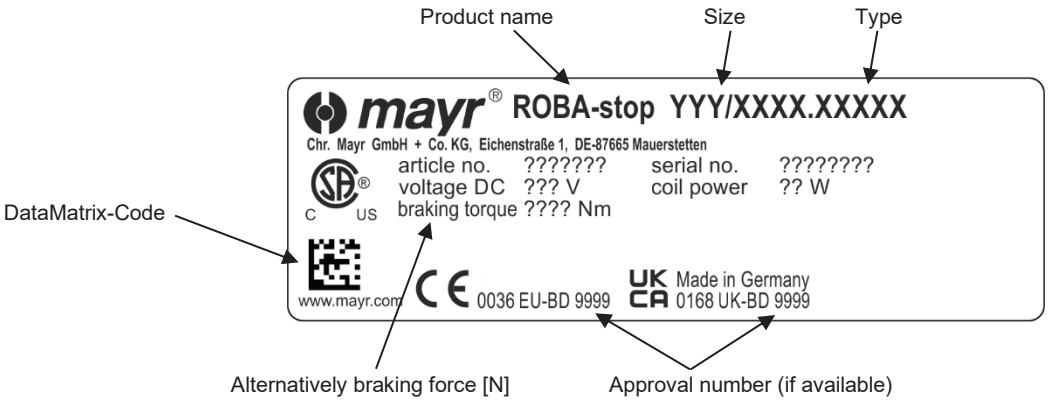
Identification

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



CE Identification

according to the Low Voltage Directive 2014/35/EU (only for DC voltage > 75 V) and/or RoHS Directive 2011/65/EU with 2015/863/EU, and the Elevator Directive 2014/33/EU (with the ID number of the respective inspection authority, for type examination tested brakes only)

UKCA Identification

according to the Low Voltage Directive UK 2016 No. 1101 (only for DC voltage > 75 V) and/or RoHS Directive UK 2012 No. 3032, and the Elevator Directive UK 2016 No. 1093 (with the ID number of the respective inspection authority, for type examination tested brakes only)

Conformity Markings

in terms of the Canadian and American approval

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Brake Illustrations

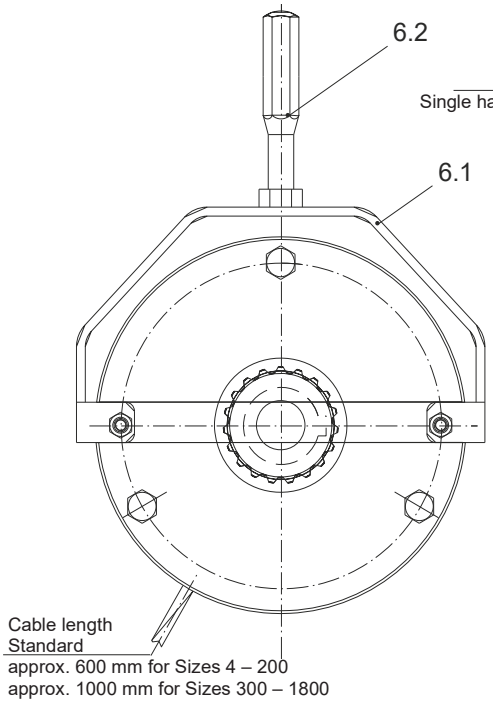

Fig. 1

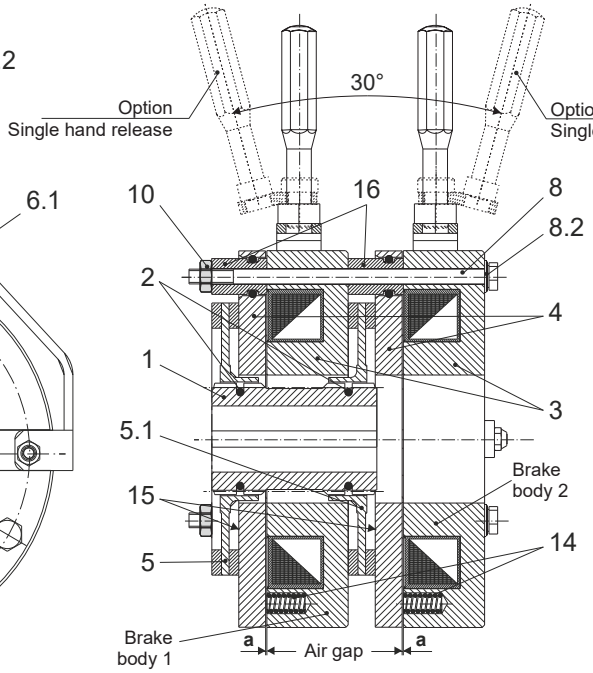

Fig. 2
(Dual circuit brake)

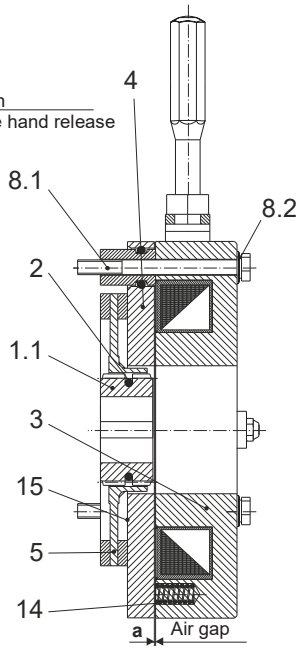

Fig. 3
(Single circuit brake)

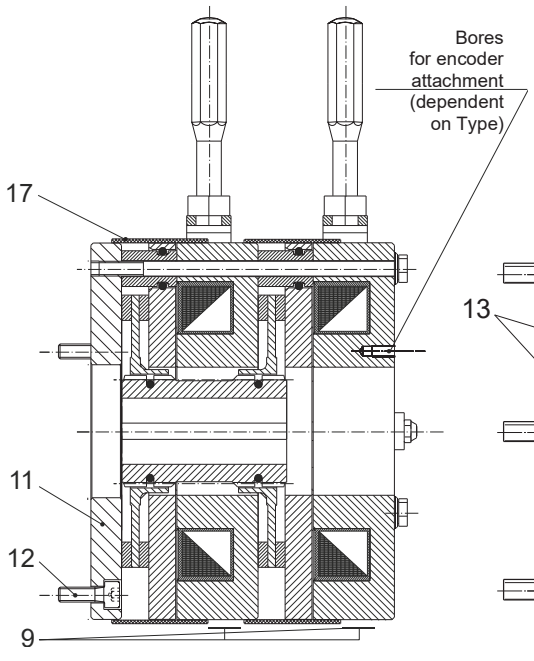

Fig. 4

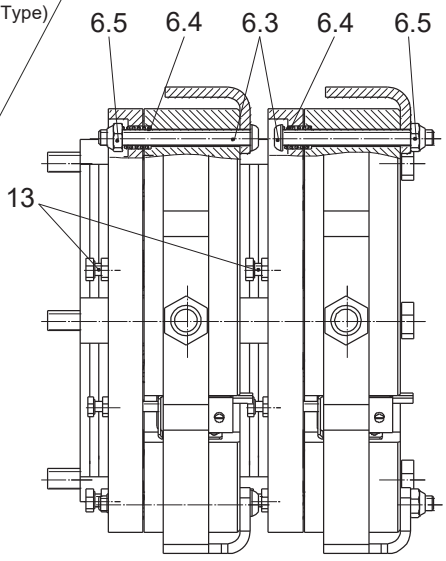

Fig. 5

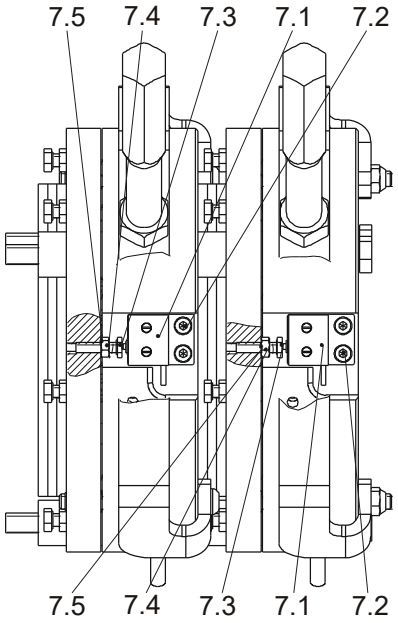

Fig. 6

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

Item	Name
1	Hub assembly with 2 O-rings (2)
1.1*	Hub assembly with 1 O-ring (2)
2	O-ring
3	Coil carrier assemblies 1 and 2
4	Armature disks 1 and 2
5	Rotor 1
5.1	Rotor 2
6	Hand release assembly
6.1	Switch bracket
6.2	Hand release rod
6.3	Screw
6.4	Thrust spring
6.5	Hexagon nut
7	Release monitoring assembly
7.1	Microswitch
7.2	Cap screw
7.3	Hexagon head screw
7.4	Hexagon nut
7.5	Spring washer
7.11	Proximity switch (assembly with adaptor plate) (Fig. 11, page 24)
7.12	Cap screw (Fig. 11, page 24)
7.13	Washer (Fig. 11, page 24)
7.14	Switching bolt (Fig. 11, page 24)
7.15	Spring ring (Fig. 11, Page 24)
8	Hexagon head screw
8.1**	Hexagon head screw
8.2	Washer
9	Type tag
10	Transportation lock (3x)
11	Flange plate
12	Cap screw
13	Noise damping
14	Thrust spring
15	Shoulder screw
16	Distance bolt
17	Cover

* Only on single circuit brake designs
** Sizes 4 – 300 only on single circuit brake designs

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Table 1: Technical Data (General)

Nominal voltages		24 V / 104 V / 180 V / 207 V
Protection (coil/casting compound)		IP54
Protection (mechanical) on design with cover, option Item 17		IP10 IP20
Protection (switch)		IP67
DUTY CYCLE		60 %
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	for designs with Type Examination certificate for designs without Type Examination certificate	-5 °C to +40 °C -20 °C to +40 °C

Table 2: Technical Data (Dependent on Size)

	Braking torque (tolerance +60 %)			Maximum speed [1]	Maximum idle speed [2]	Electrical nominal power	Mass (pilot bored)	Hand release force per lever at nominal torque, approx.
	Nominal braking torque 100 % Type 896.00_._ _	Higher braking torque 120 % Type 896.01_._ _	Reduced braking torque 75 % Type 896.02_._ _				Dual circuit brake without additional parts Type 896.0_0._0	
Size	**[Nm]**	**[Nm]**	**[Nm]**	**[rpm]**	**[rpm]**	**[W]**	**[kg]**	**[N]**
4	2 x 4	2 x 5	2 x 3	6000	10000	2 x 23	2 x 1.4	35
8	2 x 8	2 x 10	2 x 6	5000	8000	2 x 31	2 x 2.2	35
16	2 x 16	2 x 19	2 x 12	4000	8000	2 x 33	2 x 3.2	110
32	2 x 32	2 x 40	2 x 26	3400	6000	2 x 45	2 x 5.1	100
64	2 x 64	2 x 77	2 x 43	3000	6000	2 x 55	2 x 7.3	130
100	2 x 100	2 x 120	2 x 80	2500	5000	2 x 63	2 x 10.3	200
200	2 x 200	2 x 240	2 x 150	2200	4000	2 x 78	2 x 15.3	250
300	2 x 300	2 x 360	2 x 225	2000	4000	2 x 86	2 x 23	250
500	2 x 500	2 x 600 [3]	2 x 380	1300	3000	2 x 90	2 x 29	300
800	2 x 800	2 x1000 [3]	2 x 600	1150	3000	2 x 107	2 x 43.5	300 [4]
1300	2 x 1300	2 x 1560	2 x 980	1000	2500	2 x 130	2 x 59.2	320 [4]
1800	2 x 1800	2 x 2150	2 x 1350	900	2500	2 x 150	2 x 79.9	350 [4]

1) For the reduction of the dynamic braking torque, dependent on the speed, please see Table 3 “Graduation of the Nominal Braking Torque”.

2) Reduced maximum speed for the elevator industry acc. EU Type Examination Certificate on request.

3) At a braking torque adjustment of 120 %, overexcitation (1.5 to 2 x the nominal voltage) is required for safe and fast release, using our ROBA®-switch fast acting rectifier (please contact *mayr*® power transmission if necessary).

4) Release of both brakes simultaneously using a lever

Guidelines for Single Circuit Brakes
The ROBA-stop®-silenzio® brake can also be ordered as a single circuit brake. In this case, the individual values for braking torque, electrical nominal power and mass apply.

Table 3: Graduation of the Nominal Braking Torque

Size			**4**	**8**	**16**	**32**	**64**	**100**	**200**	**300**	**500**	**800**	**1300**	**1800**
Dynamic braking torque in % of the nominal braking torque M_N		[%]	100	100	100	100	100	100	100	100	100	100	100	100
	up to speed	[rpm]	4500	3500	2900	2500	2500	2250	1900	1700	1300	1150	1000	900
		[%]	85	85	85	85	80	80	80	80	-	-	-	-
	up to speed	[rpm]	5200	4200	3400	2900	3000	2500	2200	2000	-	-	-	-
		[%]	70	70	70	70	-	-	-	-	-	-	-	-
	up to speed	[rpm]	6000	5000	4000	3400	-	-	-	-	-	-	-	-

Example: Single circuit brake Type 896.10_._ _ , Size 64, speed = 3000 rpm; Dynamic braking torque = 80 % x 64 Nm = 51 Nm

At the start of a braking procedure, **high speeds** lead to high friction powers which have a direct effect on the friction contact temperature.
High temperatures lead generally to a reduction of the present friction coefficient; this in turn leads to a **reduction of the braking torque**.

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Installation and Operational Instructions for ROBA-stop®-silenzio® Type 896._ _ _._ _ Sizes 4 – 1800

(B.8.7.EN)

Design

ROBA-stop®-silenzio® brakes are spring applied, electromagnetic safety brakes, which apply a defined braking effect after the voltage is switched off or after a voltage failure.

Functional Description

The ROBA-stop®-silenzio® Type 896.0_ _._ _ is designed as a dual circuit brake in which two brake bodies working independently of each other ensure high operational safety.
The braking torque in brake body 1 (3) is generated via the contact force of several thrust springs (14) using frictional locking between both friction linings of the rotor (5), the armature disk 1 (4) and the flange plate (11) or machine wall.
The braking torque in brake body 2 (3) is generated via the contact force of several thrust springs (14) using frictional locking between both friction linings of the rotor (5.1), the armature disk 2 (4) and the coil carrier 1 (3).
The brake is released electromagnetically.

Scope of Delivery / State of Delivery

Please check the scope of delivery 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.

Application

For use as holding brake with EMERGENCY STOP braking actions

- ❒ **in enclosed buildings (in tropical regions, in high humidity with long downtimes and sea climates only after taking special measures)**
- ❒ **in dry running**
- ❒ **horizontal and vertical installation positions**
- ❒ **in clean ambient conditions (coarse-grained dust as well as liquids of all kinds affect the braking function ⇒ cover the device).**

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 or 8.1) 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 **0.04 mm** for Sizes 4 to 8, of **0.05 mm** for Sizes 16 to 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 or 1.1) and the shaft must be selected so that no widening of the hub (1 or 1.1) toothing can occur, as widening of the toothing leads to the rotors (5 and 5.1) jamming on the hub (1 or 1.1) and therefore to brake malfunctions (recommended hub – shaft tolerance H7/k6).
  If the hub (1) is heated for better joining, the O-rings must be removed beforehand and re-mounted after hub installation.
  The max. permitted joining temperature of 200 °C must not be exceeded.
- ❑ The O-rings on the hub (1 or 1.1) must be lightly greased.
- ❑ The rotors (5 and 5.1) 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 µm.
  In particular customer-side mounting surfaces made of grey cast iron are to be rubbed down additionally with fine sandpaper (grain ≈ 400).
- ❑ Please abstain from using cleaning agents containing solvents, as they could affect the friction material.
- ❑ During longer downtimes, we recommend the use of suitable corrosion protection measures for the mounting surface (e.g. zinc-phosphate coating) until initial operation.

For attaching the brake onto the motor flange, a centering aid is recommended when tightening the screws. This centering aid, in the form of a sleeve/disk, should be slid over the motor shaft and should be used to center the brake body relative to the shaft with the aid of a cone.

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Installation (Figs. 1, 2 and 4)

1. Disassemble the flange plate (11 / dependent on Type) from the brake or remove the transportation locks (Item 10 only up to size 500) from the hexagon head screws (8).
2. If necessary, mount the flange plate (11) using cap screws (12) onto the mounting surface (please observe the tightening torque according to Table 4).
3. Mount the hub assembly with the O-rings (Item 1 / **O-rings must be lightly greased**) 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).
4. Push rotor 1 (5) by hand using light pressure over both O-rings (2) onto the hub (1), so that the friction lining of rotor 1 (5) lies against the machine wall or flange plate (the rotor collar should be facing away from the machine wall or flange plate).
   Make sure that the toothing moves easily.
   Do not damage the O-rings!
5. Push brake body 1 over hub (1) and rotor collar of rotor 1 (5) (the fixing holes should align with the threaded holes in the flange plate (11) or machine wall).

   On Sizes 500 to 1800:
   Insert 3 hexagon head screws (8.1 / for Sizes 1300 and 1800: 4 pieces) including washers (8.2) uniformly distributed into brake body 1 and tighten them all around evenly **using a torque wrench to a tightening torque acc. Table 4**.
6. Push rotor 2 (5.1) by hand using light pressure over an O-ring (2) onto the hub (1), so that the friction lining of rotor 2 (5.1) lies against the brake body 1 (the rotor collar should be facing the machine wall or the flange plate).
   Make sure that the toothing moves easily.
   Do not damage the O-ring.
7. Insert the hexagon head screws (8) including washers (8.2) into the bores in brake body 2, which are equipped with distance bolts (16), and then join with brake body 1 (see Fig. 2) and screw onto the machine wall or flange plate. Tighten the hexagon head screws (8) evenly all around **using a torque wrench to a tightening torque acc. Table 4.**
8. **Inspect air gaps "a" according to Table 4**
   The nominal air gap must be given.
9. Mount the covers (17 / dependent on Type).

Table 4: Rotor Thickness, Air Gaps, Screws Items 8 / 8.1 / 12

Size	Rotor thickness New condition [mm]	Nominal air gap "a" per brake body [mm]	Maximum air gap * per brake body [mm]	Fixing screws with wrench openings and tightening torques						
				Items 8 and 8.1			Item 12			
					SW	[Nm]	Single circuit	Dual circuit brake	SW	[Nm]
4	6	0.45 +/-0.07	0.6	3 x M4	7	3	3 x M4	3 x M4	3	3
8	7	0.45 +/-0.07	0.9	3 x M5	8	5	3 x M5	3 x M5	4	5
16	8.7	0.5 +/-0.07	1.1	3 x M6	10	10	3 x M6	3 x M6	5	10
32	10	0.5 +0.04 / -0.10	1.0	3 x M6	10	13	3 x M6	3 x M6	5	15
64	11.1	0.5 +0.04 / -0.10	0.9	3 x M8	13	30	3 x M8	3 x M8	6	36
100	12.5	0.5 +/-0.07	0.8	3 x M8	13	36	3 x M8	6 x M8	6	36
200	13.9	0.5 +/-0.07	1.0	3 x M10	16	71	3 x M10	6 x M10	8	71
300	13.9	0.5 +/-0.07	1.0	3 x M12	18	123	3 x M12	6 x M12	10	123
500	16	0.5 +/-0.07	0.9	6 x M12	18	123	3 x M16	6 x M16	14	200
800	18	0.5 +/-0.07	0.8	6 x M16	24	250	3 x M16	6 x M16	14	300
1300	18	0.5 +/-0.07	0.9	8 x M16	24	250	4 x M16	8 x M16	14	300
1800	18	0.5 +/-0.07	0.9	8 x M16	24	300	4 x M20	8 x M20	17	470

* 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.

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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Brake Inspection (before brake initial operation)

- ❑ **Braking torque inspection:**
  Please compare the requested braking torque with the torque stated on the Type tag.
- ❑ **Carry out a release inspection:**
  by energizing the brake or manually with the hand release (dependent on Type).
- ❑ **Carry out a functional inspection of the release monitoring device:**
  see pages 23/24 (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 load begin to move after release of one brake circuit or should it fail to decelerate noticeably during the braking procedure, the energized coil must be switched off immediately!
The dual circuit braking function is not guaranteed.
Shut down the drive, 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 energizing the individual circuits with nominal voltage. 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. Technical Data).

Inspection brake circuit 1:

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

Inspection brake circuit 2:

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

Inspection of both brake circuits:

Energize both brake circuits with nominal voltage, see Type tag (9).
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 inadvertent movement of the car, 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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Hand Release (Sizes 4 to 500)

The hand release is installed and set manufacturer-side!

Hand Release Installation (Figs. 7 and 7a) Manufacturer-side

For hand release installation, the brake must be dismantled and de-energized.

CAUTION

On the Sizes 4 to 300, the installation procedure is different for brake bodies 1 and 2 (see Fig. 7). If the brake is installed in the wrong order, it could fail.

On Size 500, the installation procedure for brake bodies 1 and 2 (see Fig. 7a) is identical.

If the brake installation situation features a vertical axis, the hand release rod must be removed after hand release actuation from Size 200 on.

Installation onto Brake Body 1 (Sizes 4 to 300)

1. Screw the hand release rod (6.2) into the switch bracket (6.1) and secure it using Loctite 243.
2. Insert the screws (6.3) through the slot bores of the switch bracket (6.1).
3. Insert the screws (6.3) with the switch bracket (6.1) into the bores on the coil carrier (3).
4. **Please ensure correct position of the switch bracket (6.1).**
   The switch bracket (6.1) with the screwed-in hand release rod (6.2) must lie over brake body 1.
5. Push the thrust springs (6.4) armature disk-side onto the screws (6.3) and apply the hexagon nuts (6.5).
   Attention! On construction sizes 4, 8, 32, 64 and 100, a washer should go between the thrust spring (6.4) and the locking nut (6.5).
6. Tighten the hexagon nuts (6.5) evenly, until the specified adjustment dimension “Y” (Fig. 7 and Table 5) is reached.

Installation onto Brake Body 2 (Sizes 4 to 300)

1. Screw the hand release rod (6.2) into the switch bracket (6.1) and secure it using Loctite 243.
2. Mount the thrust springs (6.4) onto the screws (6.3).
   Attention! On construction sizes 4 and 8, a washer should go between the screw head (6.3) and the thrust spring (6.4).
3. Insert the screws (6.3) with the mounted thrust springs (6.4) through the coil carrier (3) into the bores on the armature disk (4).
4. Push the switch bracket (6.1) onto the two screws (6.3) and apply the locking nuts (6.5).
   Attention! On construction sizes 32, 64 and 100, a washer should go between the switch bracket (6.1) and the locking nut (6.5).
5. **Please ensure correct position of the switch bracket (6.1).**
   The switch bracket (6.1) with the screwed-in hand release rod (6.2) must lie over brake body 2.
6. Tighten the locking nuts evenly, until the specified adjustment dimension “Y” has been reached.

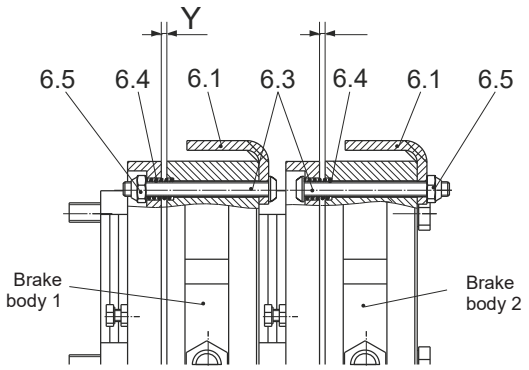

Fig. 7 (Sizes 4 to 300)

Table 5: Adjustment Dimension, Hand Release Force, Actuation Angle

Size	Dimension "Y"	Hand release force per lever	Actuation angle
4	1.1 mm	35 N	15 °
8	1.5 mm	35 N	15 °
16	1.6 mm	110 N	15 °
32	1.5 mm	100 N	15 °
64	1.5 mm	130 N	15 °
100	1.5 mm	200 N	15 °
200	1.5 mm	250 N	15 °
300	1.5 mm	250 N	15 °
500	(1.5 mm)	300 N	-

Installation onto Brake Bodies 1 and 2 (Size 500)

1. Screw out both hexagon nuts (6.5), including their washers, from the hand release assembly (6).
2. Insert the hand release assembly (6) with the mounted thrust springs (6.4) through the coil carrier (3) into the bores on the armature disk (4).
3. Apply both hexagon nuts (6.5 / secured with Loctite 243) incl. washers again.
4. **Tighten both hexagon nuts (6.5) evenly using a torque wrench and a tightening torque of 10 Nm.**

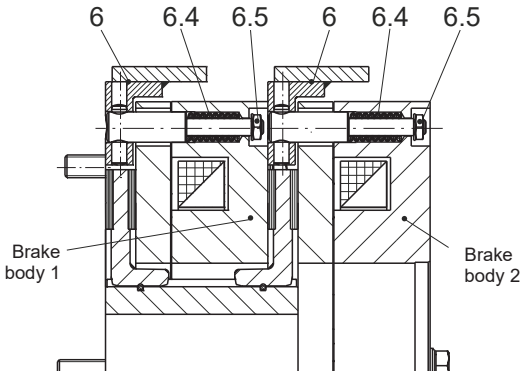

Fig. 7a (Size 500)

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Hand Release (Sizes 800 to 1800)

The hand release devices for Sizes 800 to 1800 must only be installed and adjusted at the *mayr*® site of manufacture.

Furthermore, an **Additional Instruction Sheet B.8.7.H._ _** is included in the brake delivery.

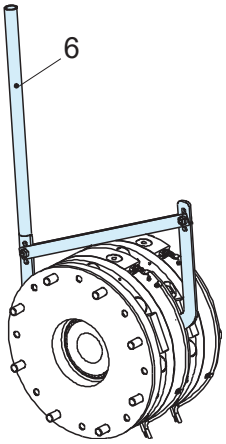

Fig. 7b (Sizes 800 to 1800)

Noise Damping

Replacing the damping element is only permitted at the *mayr*® site of manufacture.

The noise damping used here was set and adjusted manufacturer-side.
However, this component is subject to aging dependent on the application or operating conditions (torque adjustment, switching frequency, ambient conditions, system vibrations etc.).

In new condition, the noise level is < 50 dB(A) (sound pressure level measurement, AC-side switching).

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Single Hand Release (Special Design Option)

(not on Sizes 300 to 1800)

The hand release is installed and set manufacturer-side!

Additional parts to standard hand release:
6.6 Bracket
6.7 Cap screw

Single Hand Release Installation (Figs. 7 – 8) Manufacturer-side

For single hand release installation, the brake must be dismantled and de-energized.

CAUTION

The installation procedure is different for brake bodies 1 and 2 (see Figs. 7 and 8). If the brake is installed in the wrong order, it could fail.

Single Hand Release Installation on Brake Body 1

1. Screw the bracket (6.6) with the cap screw (6.7) into the switch bracket (6.1) vertical to the switch bracket (6.1) as shown in Fig. 8, and secure it using Loctite 243.
   Please observe the tightening torque acc. Table 6!
2. Screw the hand release rod (6.2) into the bracket (6.6) and secure it using Loctite 243.
3. Insert the screws (6.3) through the slot bores of the switch bracket (6.1).
   Attention! On construction sizes 32, 64 and 100, a washer should go between the screw head (6.3) and the switch bracket (6.1).
4. Insert the screws (6.3) with the switch bracket (6.1) into the bores on the coil carrier (3).
5. **Please ensure correct position of the switch bracket (6.1).**
   The switch bracket (6.1) with the screwed-in hand release rod (6.2) must lie over brake body 1 and the hand release rod (6.2) must face in the direction of the machine wall.
6. Push the thrust springs (6.4) armature disk-side onto the screws (6.3) and apply the hexagon nuts (6.5).
7. Tighten the hexagon nuts (6.5) evenly, until the specified adjustment dimension “Y” (Fig. 7 and Table 5) is reached.

Table 6: Tightening Torques Screws Item 6.7

Size	Tightening torque for cap screw Item 6.7 [Nm]
4	6
8	10
16	24
32	24
64	48
100	48
200	83

Single Hand Release Installation on Brake Body 2

1. Screw the bracket (6.6) with the cap screw (6.7) into the switch bracket (6.1) vertical to the switch bracket (6.1) as shown in Fig. 8, and secure it using Loctite 243.
   Please observe the tightening torque acc. Table 6!
2. Screw the hand release rod (6.2) into the bracket (6.6) and secure it using Loctite 243.
3. Mount the thrust springs (6.4) onto the screws (6.3).
4. Insert the screws (6.3) with the mounted thrust springs (6.4) through the coil carrier (3) into the bores on the armature disk (4).
5. Push the switch bracket (6.1) onto the two screws (6.3) and apply the locking nuts (6.5).
   Attention! On construction sizes 32, 64 and 100, a washer should go between the switch bracket (6.1) and the locking nut (6.5).
6. **Please ensure correct position of the switch bracket (6.1).**
   The switch bracket (6.1) with the screwed-in hand release rod (6.2) must lie over brake body 2 and the hand release rod (6.2) must face away from the machine wall.
7. Tighten the locking nuts evenly, until the specified adjustment dimension “Y” has been reached.

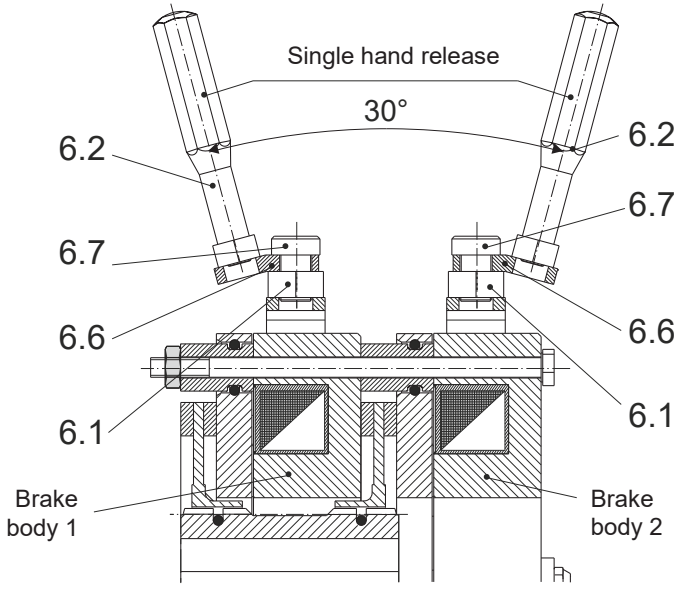

Fig. 8

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Deviations on Single Circuit Brake Design

The ROBA-stop®-silenzio® brake can also be ordered as a single circuit brake. In this case, the individual values for nominal braking torque, electrical nominal power and mass apply.

CAUTION

Single circuit brakes do not meet the demands acc. the EN 81-20 standard or the BGV C1 (previously VGB 70) and DIN EN 17206 (previously DIN 56950-1) for installation in elevators and theatre stage technical systems.

Deviating Parts

Item 1.1: hub for single circuit brake (instead of Item 1)

On Sizes 4 – 300:
Item 8.1: hexagon head screw for single circuit brake (instead of Item 8)

Functional Description

The braking torque in brake body 1 (3) is generated via the contact force of several thrust springs (14) using frictional locking between both friction linings of the rotor (5), the armature disk 1 (4) and the flange plate (11) or machine wall.

Installation (Figs. 1, 3 and 4)

1. Disassemble the flange plate (11 / dependent on Type).
2. If necessary, mount the flange plate (11) using cap screws (12) onto the mounting surface (please observe the tightening torque according to Table 4).
3. Mount the hub assembly with the O-ring (Item 1.1 / **O-ring must be lightly greased)** onto the shaft and bring it into the correct position. Make sure that the length of the key lies over the entire hub, and secure axially (e.g. using a locking ring).
4. Push the rotor (5) by hand using light pressure over the O-ring (2) onto the hub (1.1) (the rotor collar should face away from the machine wall or flange plate (11)).
   Make sure that the toothing moves easily.
   Do not damage the O-ring.
5. Push brake body 1 over hub (1.1) and rotor collar of rotor 1 (5) (the fixing holes should align with the threaded holes in the flange plate (11) or machine wall).
6. Insert hexagon head screws (8.1) including washers (8.2) into brake body 1 and screw onto the machine wall or flange plate (11). Tighten the hexagon head screws (8.1) evenly all around **using a torque wrench to a tightening torque acc. Table 4.**
7. **Inspect air gap “a” according to Table 4**
   The nominal air gap must be given.
8. Mount the cover (17 / dependent on Type).

Hand Release Installation (Fig. 9) onto Brake Body (Sizes 4 to 300)

1. Screw the hand release rod (6.2) into the switch bracket (6.1) and secure it using Loctite 243.
2. Mount the thrust springs (6.4) onto the screws (6.3).
3. Insert the screws (6.3) with the mounted thrust springs (6.4) through the coil carrier (3) into the bores on the armature disk (4).
4. Push the switch bracket (6.1) onto the two screws (6.3) and apply the locking nuts (6.5).
   Attention! On construction sizes 32, 64 and 100, a washer should go between the switch bracket (6.1) and the locking nut (6.5).
5. **Please ensure correct position of the switch bracket (6.1).**
   The switch bracket (6.1) with the screwed-in hand release rod (6.2) must lie over brake body 1.
6. Tighten the locking nuts evenly, until the specified adjustment dimension “Y” has been reached.

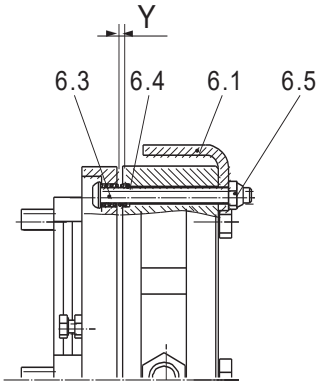

Fig. 9

Hand Release Installation (Fig. 9a) onto Brake Body (Size 500)

1. Screw out both hexagon nuts (6.5), including their washers, from the hand release assembly (6).
2. Insert the hand release assembly (6) with the mounted thrust springs (6.4) through the coil carrier (3) into the bores on the armature disk (4).
3. Apply both hexagon nuts (6.5 / secured with Loctite 243) incl. washers again.
4. **Tighten both hexagon nuts (6.5) evenly using a torque wrench and a tightening torque of 10 Nm.**

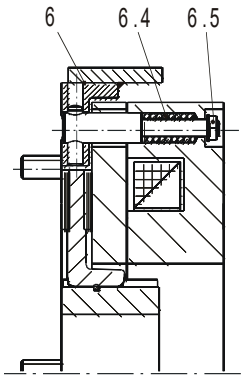

Fig. 9a

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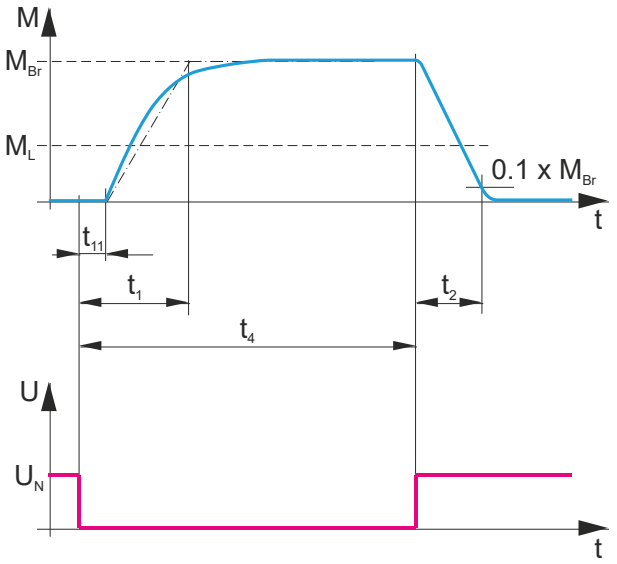
Switching Times

The switching times are only valid for the braking torques stated in the catalogue and 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. According to Directive VDI 2241, the switching times are measured at a sliding speed of 1 m/s with reference to a mean friction radius. The brake switching times are influenced by the temperature, by the air gap between the armature disk and the coil carrier, which depends on the wear status of the linings, and by the type of voltage-limiting components.
These values stated in the Table 7 are mean values which refer to the nominal air gap and the nominal torque on a warm brake.
Typical switching time tolerances are ± 20 %.

Please Observe: DC-side switching
When measuring the DC-side switching times (t_{11} – time), the inductive switch-off voltage peaks are according to VDE 0580 limited to values smaller than 1200 volts. If other voltage-limiting components and parts are installed, this switching time t_{11} and therefore also switching time t_1 increase.

Torque-Time Diagram



Key:
M_{Br} = Braking torque
M_L = Load torque
t_1 = Connection time
t_{11} = Response delay on connection
t_2 = Separation time
t_4 = Slip time + t_{11}
U_N = Coil nominal voltage

Table 7: Switching Times in New Condition

Size	Nominal braking torque [Nm]	Connection time t_1 (DC switching) [ms]	Connection time t_1 (AC switching) [ms]	Separation time t_2 [ms]	Response delay t_{11} on connection (DC switching) [ms]	Response delay t_{11} on connection (AC switching) [ms]
4	2 x 4	33	135	52	6	52
8	2 x 8	46	196	70	9	79
16	2 x 16	99	398	94	20	145
32	2 x 32	121	518	120	32	229
64	2 x 64	110	447	174	34	164
100	2 x 100	160	488	234	35	154
200	2 x 200	190	968	270	60	412
300	2 x 300	245	1087	308	60	429
500	2 x 500	260	1133	444	65	518
800	2 x 800	270	1231	581	65	531
1300	2 x 1300	270	1464	589	80	588
1800	2 x 1800	300	1920	850	100	800

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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 can take place with alternating voltage using a rectifier or another suitable DC power 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 when operating noise-damped brakes

In order to minimise **noise development of the released brake**, it must only be operated via DC voltage with low ripple content. AC voltage 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, phase angle control systems, ...) are not suitable for operation of the brake.

At variance with this, brakes specially dimensioned for overexcitation must be operated with the ROBA®-switch fast acting rectifier.

Grounding 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!

Device Fuses

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

Switching Behavior

The reliable operational behavior 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 (4) and the coil carrier (3) (dependent on the wear condition of the linings).

Magnetic Field Build-up

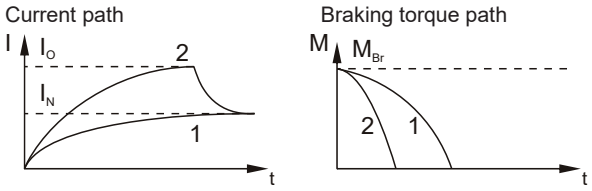
When the voltage is switched on, a magnetic field is built up in the brake coil, which attracts the armature disk (4) to the coil carrier (3) and releases the brake.

Field build-up with normal excitation

If the magnetic coil is energized 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.



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_O

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_O on each brake size (guideline value: $2 \times t_2 \leq t_O \leq 3 \times t_2$).
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_O is less than the doubled separation time t_2 on each brake size.
- Spring force (braking torque adjustment) = 100 %:
The overexcitation time t_O is the doubled separation time t_2 on each brake size.
- Spring force (braking torque adjustment) >100 %:
The overexcitation time t_O is higher than the doubled separation time t_2 on each brake size.

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**** RMS coil capacity P**

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

Calculations:

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

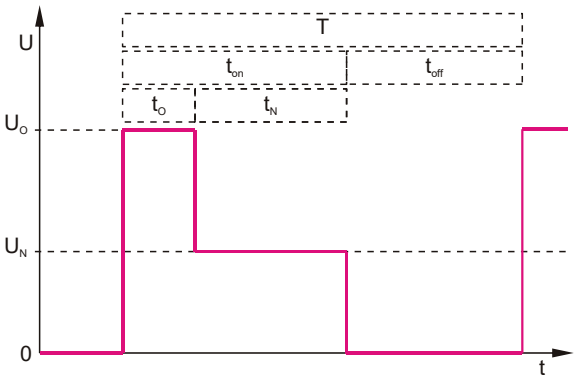
$$P = \frac{P_O \times t_O + P_N \times t_N}{T}$$

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

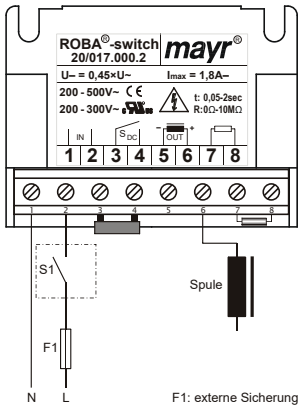
$$P_O = \left(\frac{U_O}{U_N}\right)^2 \times P_N$$

t_O	[s]	Overexcitation time
t_N	[s]	Time of operation with coil nominal voltage
t_{off}	[s]	Time without voltage
t_{on}	[s]	Time with 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:



AC-side switching

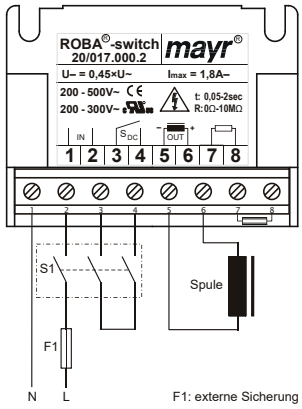


The power circuit is interrupted in front of the rectifier. The magnetic field slowly reduces.
This delays the rise in braking torque.

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 switch-off), 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 switching 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 may be 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), although this may of course then alter the switching times.

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Permitted Brake Friction Work (Sizes 500 to 1800)

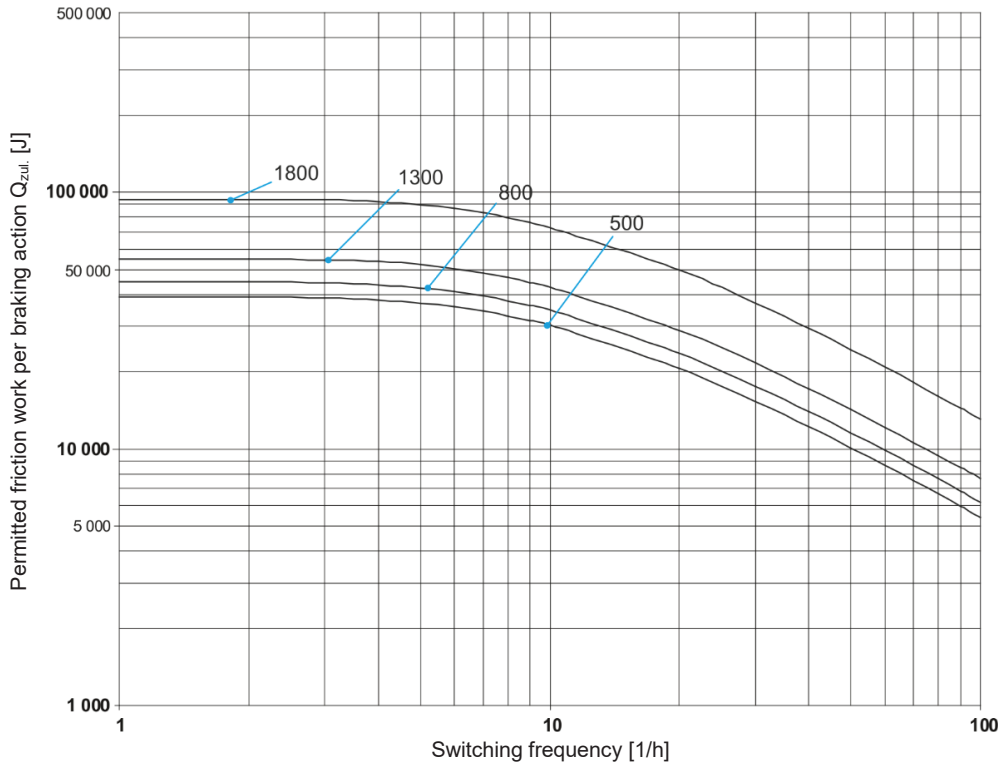
Friction Power Diagram (Sizes 500 to 1800)

The permitted friction work values dependent on the switching frequency shown in the characteristic curves must not be exceeded, not even in EMERGENCY STOP operation.

The following diagram shows the permitted friction work values $Q_{zul.}$ referring to the respective switching frequency for the brake Sizes 500 to 1800 and rated speeds.

n = 750 rpm
for Sizes 500 to 1300

n = 500 rpm
for Size 1800



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Permitted Brake Friction Work (Sizes 4 to 300)

The permitted friction work $Q_{zul.}$ dependent on the intended switching frequency S_h can be calculed using the formula below and the values listed in Table 8.
Here, the transition switching frequency $S_{hü}$ represents a characteristic brake value.

1. Calculation of the permitted friction work $Q_{zul.}$

$$Q_{zul.} = Q_E \times (1 - e^{-\frac{S_{hü}}{S_h}}) \quad [J]$$

Key:

n	[rpm]	Speed
Q_E	[J]	Max. permitted friction work (Table 8)
$Q_{zul.}$	[J]	Permitted friction work
S_h	[1/h]	Switching frequency
$S_{hü}$	[1/h]	Transition switching frequency (Table 8)

2. Example

Data	*Values from Table 8*
Size 16	Q_E = 12000 J up to n = 2000 rpm
n =1500 rpm	$S_{hü}$ = 8.2/h
S_h = 4/h	

Calculation:

$$Q_{zul.} = 12000 \times (1 - e^{-\frac{8.2}{4}}) \quad [J]$$

$Q_{zul.}$ = 10455 J

3. Diagram (The diagram only serves as an example)

n = 2000 rpm
for Size 16

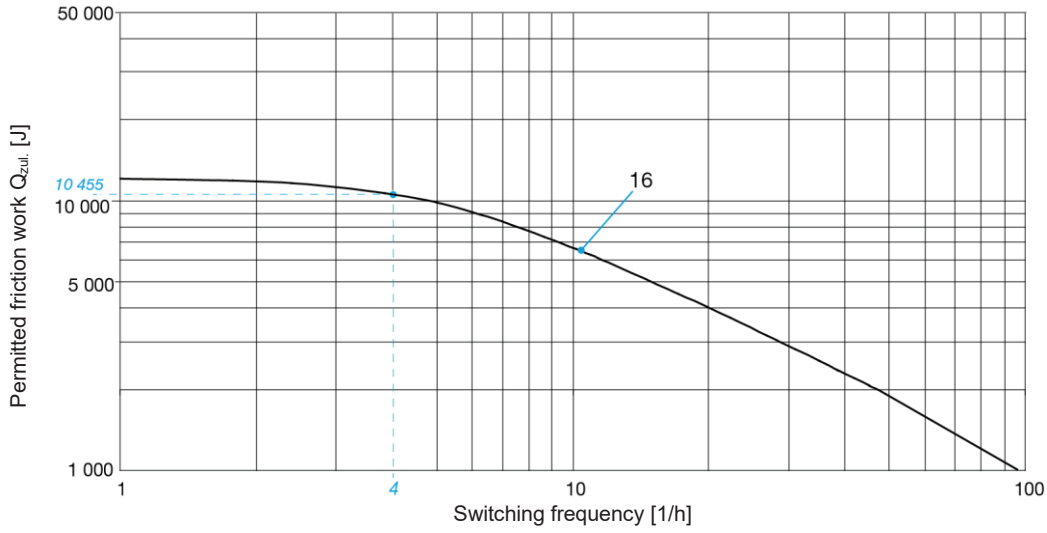

Table 8: Friction Work Q_E and Transition Switching Frequency $S_{hü}$ (Sizes 4 to 300)

Friction work Q_E / Transition switching frequency $S_{hü}$			Size 4	8	16	32	64	100	200	300
Max. permitted friction work	Q_E	[J]	6000	7500	14000	18000	-	-	-	-
up to speed	n	[rpm]	1500	1250	1000	850	-	-	-	-
Transition switching frequency	$S_{hü}$	[1/h]	9.2	9.2	7.1	6.9	-	-	-	-
Max. permitted friction work	Q_E	[J]	5000	6000	12000	15000	22000	28000	36000	42000
up to speed	n	[rpm]	3000	2500	2000	1700	1500	1250	1100	1000
Transition switching frequency	$S_{hü}$	[1/h]	11	11.5	8.2	8.3	6.9	7.2	5	4
Max. permitted friction work	Q_E	[J]	1000	1200	2000	3000	12000	15000	20000	24000
up to speed	n	[rpm]	6000	5000	4000	3400	3000	2500	2200	2000
Transition switching frequency	$S_{hü}$	[1/h]	55.5	57.5	49.4	41.3	12.6	13.4	9	7

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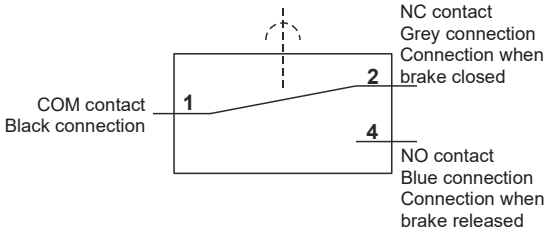
Release Monitoring with Microswitch (Dependent on Type) (Fig. 10)

Please carry out a functional inspection before brake initial operation!

The **ROBA-stop®-silenzio®** brakes are supplied with manufacturer-side set release monitoring devices.
One microswitch (7.1) 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 energized, a time span of three times the separation time must pass before the microswitch signal on the release monitoring is evaluated.

Microswitch (7.1) Wiring Diagram:



Release Monitoring Function

When the magnetic coil is energized in the coil carrier (3), the armature disk (4) is attracted to the coil carrier (3), a microswitch (7.1) emits a signal, the brake is released.

For brake design with hand release: When actuating the hand release (6), a switching signal of the microswitch (7.1) cannot be guaranteed.

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)

If a replacement or new adjustment of the microswitch (7.1) is required by the customer, separate adjustment instructions stating the article or serial number of the respective brake can be requested from the manufacturer.

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!

Customer-side Inspection after Attachment

The customer-side connection is an NO contact.
Please inspect the release monitoring units:
Brake de-energized ➔ Signal "OFF",
Brake energized ➔ Signal “ON”

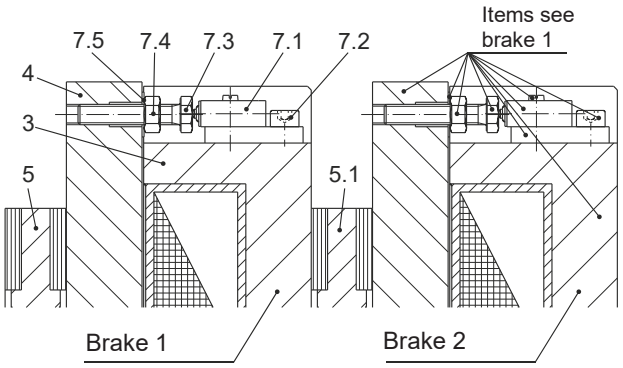


Fig. 10

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Release Monitoring with Proximity Switch (Sizes 8 to 1800) (Dependent on Type) (Fig. 11)

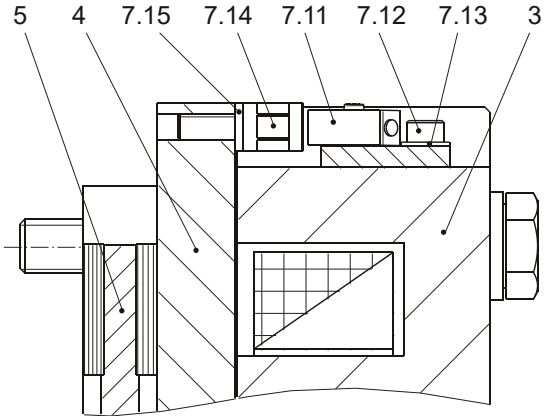


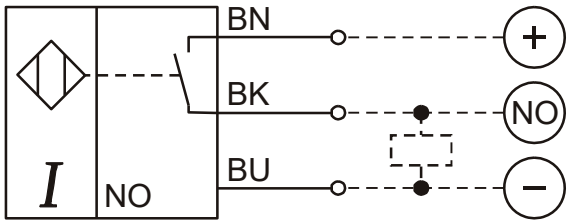
Fig. 11

The **ROBA-stop®-silenzio®** brakes are supplied with manufacturer-side installed and adjusted release monitoring devices.
One proximity switch (7.11) per brake circuit emits a signal for every brake signal condition change:
"brake opened" or "brake closed".

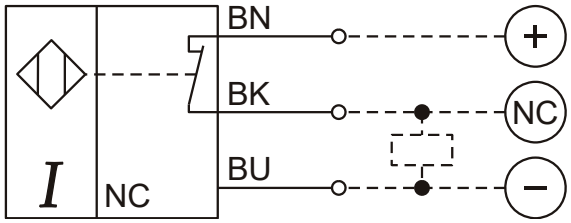
The customer is responsible for a signal evaluation of both conditions.
From the point at which the brake is energized, a time span of three times the separation time must pass before the proximity switch signal on the release monitoring is evaluated.

Proximity Switch (7.11) Wiring Diagram:

a) NO contact:



b) NC contact:



Release Monitoring Function

When the magnetic coil in the coil carrier (3) is energized, the armature disk (4) is attracted to the coil carrier (3).
The proximity switch (7.11) emits a signal, the brake is released.

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.

For brake design with hand release:
When actuating the hand release (6), a switching signal of the proximity switch (7.11) cannot be guaranteed.

Technical Data

Operating DC voltage:	10... 30 V
Residual ripple content:	≤ 10 % U_{ss}
DC rated operating current:	≤ 150 mA
No-load current I_0:	≤ 15 mA
Residual current:	≤ 0.1 mA
Rated insulation voltage:	≤ 0.5 kV
Short-circuit protection:	yes / synchronizing
Line voltage drop at I_e:	≤ 1.8 V
Wire breakage protection / reverse voltage protection:	yes / completely
Output function:	3-wire, NO contact or NC contact, PNP
Switching frequency:	≤ 2 kHz

If a replacement or new adjustment of the proximity switch (7.11) is required by the customer, separate adjustment instructions stating the article or serial number of the respective brake can be requested from the manufacturer.

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

Customer-side Inspection after Attachment

a) Proximity switch (NO contact):

Please inspect the release monitoring unit:
Brake de-energized ➔ Signal "OFF"
Brake energized ➔ Signal "ON"

b) Proximity switch (NC contact):

Please inspect the release monitoring unit:
Brake de-energized ➔ Signal "ON"
Brake energized ➔ Signal "OFF"

The following prevent actuation of the proximity switch (7.11) and lead to a malfunction:

- ❑ Heavy contamination between the armature disk (4) and the coil carrier (3).
- ❑ Extreme warping on the armature disk (4)
- ❑ Excessively large air gap "a" between the armature disk (4) and the coil carrier (3) 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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Maintenance

ROBA-stop®-silenzio® brakes are largely 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. Therefore, the following inspections should be carried out at regular intervals:

- Braking torque or retardation inspection (individual brake circuits) (min. 1 x per year)
- Inspection of air gaps "a" braked (min. 1 x per year)

In order to inspect the wear condition of the rotors 1 (5) and 2 (5.1), please measure the air gaps “a” (Fig. 2 and Table 4).
The rotors must be replaced at the latest when the maximum air gap
has been reached (Table 4).

Before replacing the rotors (Items 5 and 5.1):

❒ Clean the brake, remove abraded particles (use an industrial vacuum and wear a dust mask).
❒ Measure the rotor thickness (new); rotor thickness acc. Table 4 must be given.

Replacing the rotors (Items 5 and 5.1)

Replace the rotors by following the Brake Installation instructions backwards.

CAUTION

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 fibers.

Possible hazards:
No potential dangers have been recognized so far when the brake is used according to its intended purpose. When grinding in the brake 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 behavior:
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!

❒ 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.

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 / ROBA®-switch / 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 pads with coil /cable and all other steel components:
Steel scrap (Code No. 160117)

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

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

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

Guidelines on the WEEE Directive 2012/19/EU
Avoidance of waste from electrical and electronic devices and the reduction of such waste through recycling.

Our electromagnetic products (brakes, clutches) as well as the components required to control them (rectifiers) are frequently used in electrical and electronic devices within the appropriate area of application of WEEE, independent of the applicable product categories.
The stated products do not fall within the area of application of this Directive. They have been classified as electromagnetic / electronic components (VDE 0580) or as electronic equipment (DIN EN 50178), and have been determined for installation in devices for "use in accordance with the intended purpose". Only products which are to be viewed as devices in terms of the Directive and not as parts or components are subject to registration obligations.

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Malfunctions / Breakdowns

Malfunction	Possible Causes	Solutions
Brake does not release	❑ Incorrect voltage on rectifier ❑ Air gap too large (worn rotor) ❑ Coil interrupted	❑ Apply correct voltage ❑ Replace the rotor ❑ 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 microswitch	❑ Solution as above ❑ Replace the microswitch (manufacturer-side)

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.

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