Installation and Operational Instructions for ROBA®-duplostop® Type 8010._ _ _ _ _ Sizes 200 to 1000

(B.8010.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.

Contents:

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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 766

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 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 use 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 fulfil 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, Authorisation and Restriction of Chemicals. This regulates the manufacture, placing on the market and use of chemical substances in preparations, under certain conditions also pertaining to substances in products. *mayr*® power transmission exclusively manufactures products (articles: clutches/couplings, electric motors, brakes and the appropriate rectifiers) in accordance with the definition in Article 3 Section 3 of the REACH Regulation. In some products (ROBA-stop®, Sizes 2 – 11, Type 8 - -.- - -.- / ROBA-stop®-M, Sizes 2 – 500, Type 891.- - -.- / ROBA-stop®-silenzio®, Sizes 4 – 8, Type 896.- - -.- - / ROBA®-topstop®, Sizes 100 – 260, Type 899.- - -.- -), shoulder screws are installed which are made from a copper alloy containing up to 2.5 % by weight lead. 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 Concerning the Classification, Labelling and Packaging of Substances and Mixtures (CLP Regulation) and are therefore not subject to the classification and labelling obligations. We would hereby 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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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 (see Type key).
- ❒ 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 foreign bodies.

Please ensure that the brake is clean and oil-free, as both brake circuits have an effect on the same linings. 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. The surface is rough-sawn and unprocessed (rolled material).

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 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 disks 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.

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!

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: Protection against large body surfaces and large foreign bodies > 50 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): 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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User-implemented Protective Measures:

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

Standards, Directives and Regulations Used and To Be Applied

DIN VDE 0580	Electromagnetic devices and components, general specifications
2014/35/EU	Low Voltage Directive
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
EN ISO 12100	Safety of machinery – General principles for design - Risk assessment and risk reduction
DIN EN 61000-6-4	Interference emission
EN 12016	Interference immunity (for elevators, escalators and moving walkways)

Liability

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

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

Guarantee

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

CE Identification

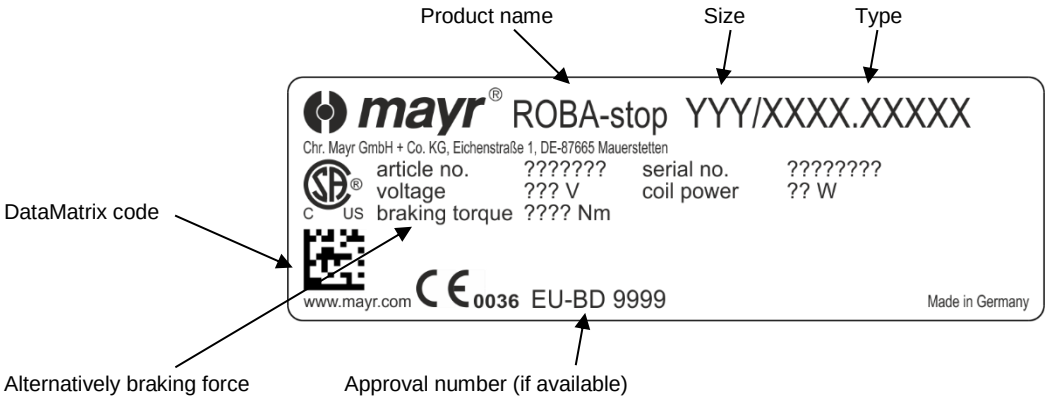
CE in accordance with the Low Voltage Directive 2014/35/EU (only in case of voltages > 72 V) and / or RoHS Directive 2011/65/EU with 2015/863/EU, and the Elevator Directive 2014/33/EU
(with the ID number of the respective inspection authority, for type examination tested brakes only)

Conformity Markings

c SP us in terms of the Canadian and American approval

Identification

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



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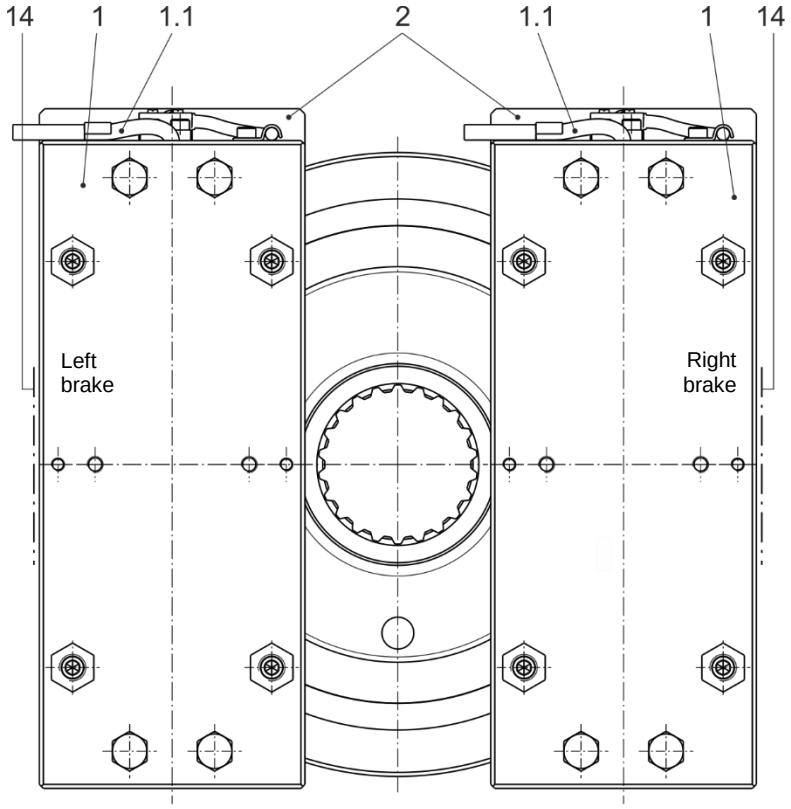

Fig. 1

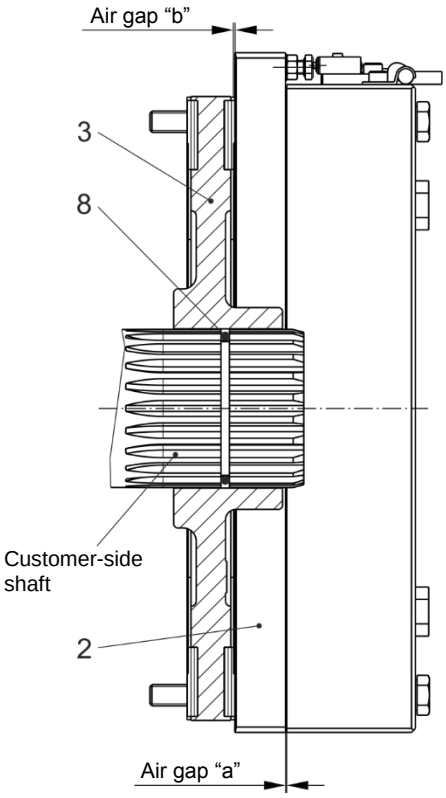

Fig. 2a

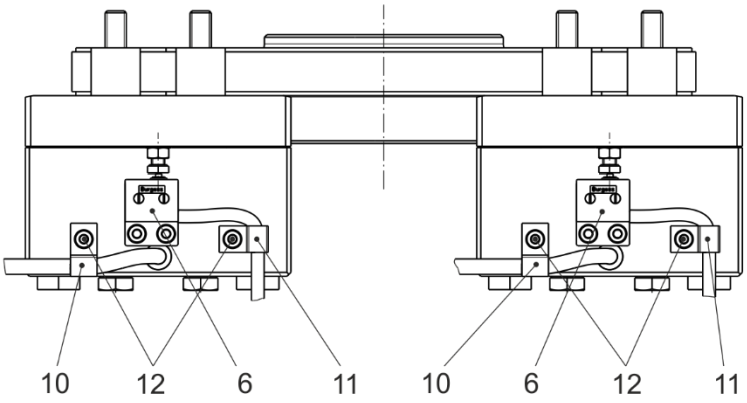

Fig. 3

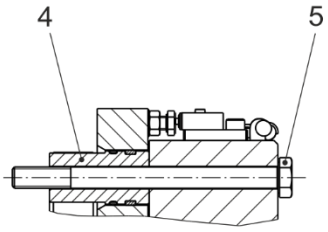

Fig. 4

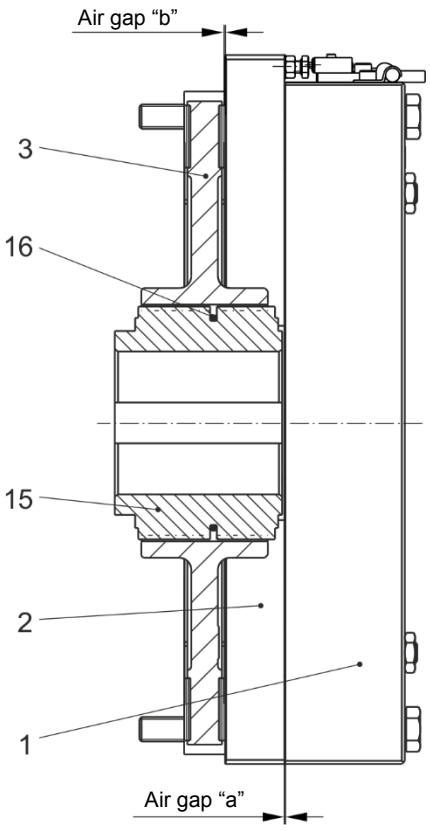

Fig. 2b

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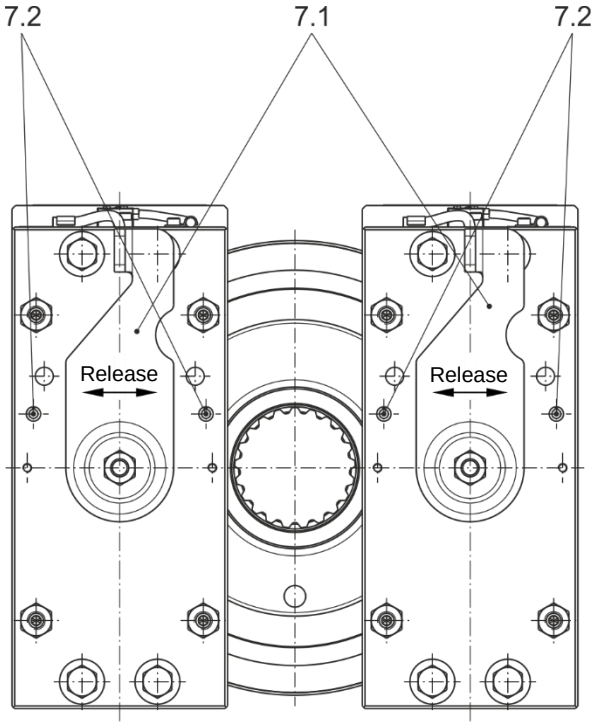

Fig. 5 (Hand release for Bowden cable)

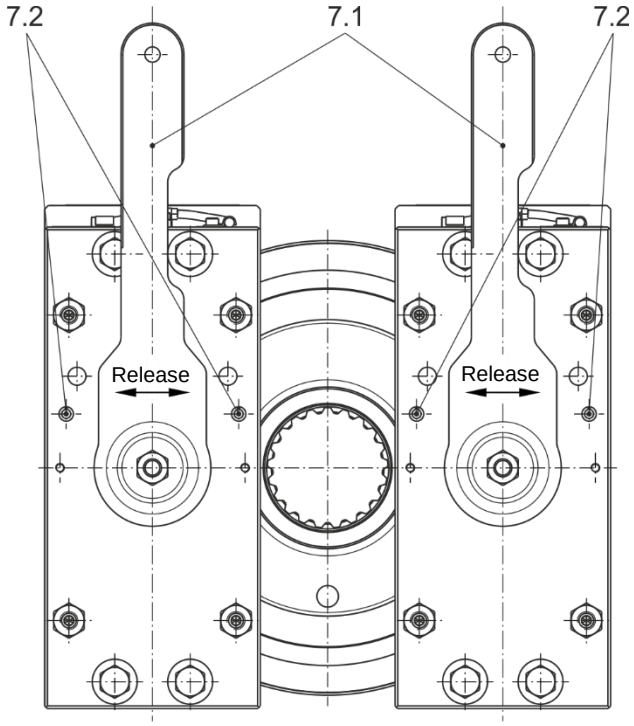

Fig. 6 (Hand release with hand release lever)

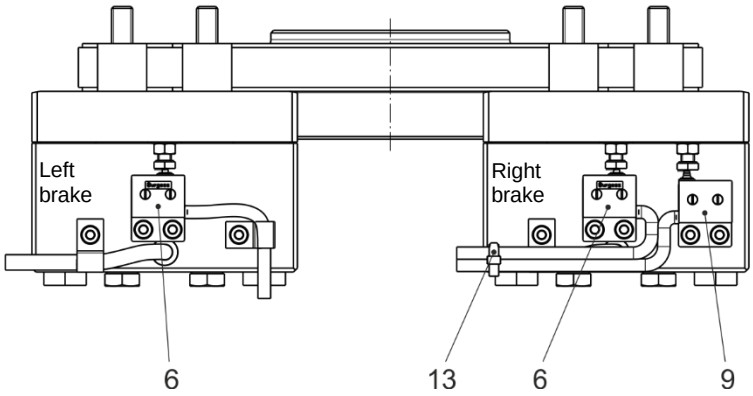

Fig. 7

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

Item	Name
1	Coil carrier assembly (incl. magnetic coils)
1.1	Connection cable 2-wire; connection coil blue/brown
2	Armature disk
3	Rotor
4	Distance bolt
5	Hexagon head screw with strength 8.8 acc. DIN EN ISO 4014: On Size 200: M8 On Size 400: M10 On Size 600: M12 On Size 800: M12 On Size 1000: M16
6	Release monitoring assembly
6.1	Microswitch incl. adaptor plate (Fig. 9, page 17)
6.2	Cap screw (Fig. 9, page 17)
6.3	Hexagon nut (Fig. 9, page 17)
6.4	Hexagon head screw (Fig. 9, page 17)
6.5	Spring washer (Fig. 9, page 17)
7	Hand release assembly
7.1	Hand release lever
7.2	Spring pin
8	O-ring NBR 70 (not included in the standard scope of delivery): On Size 200 (all designs): D48 x 3 On Size 400 (short design): D55 x 3 On Size 400 (long design): D60 x 3 On Size 600 (all designs): D60 x 3 On Size 800 (650 Nm / 830 Nm design): D67 x 3 On Size 800 (930 Nm design): D76 x 3 On Size 1000 (920 Nm / 1015 Nm design): D76 x 3 On Size 1000 (1200 Nm design): D82 x 3
9	Wear monitoring assembly
9.1	Microswitch incl. adaptor plate (Fig. 10, page 18)
9.2	Cap screw (Fig. 10, page 18)
9.3	Hexagon nut (Fig. 10, page 18)
9.4	Hexagon head screw (Fig. 10, page 18)
9.5	Spring washer (Fig. 10, page 18)
10	Cable clamp D6 for coil cable
11	Cable clamp D6 for microswitch cable
12	Cap screw M4 x 8
13	Cable tie
14	Type tag (on the side of the coil carriers)
15	Hub
16	O-ring

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

Nominal air gap [1] "a" braked (Figs. 2a/b)	0.45 mm
Limit air gap [2] "a" at nominal torque (Figs. 2a/b)	0.9 mm
Inspection air gap "b" on released brake (Figs. 2a/b)	min. 0.25 mm
Protection (coil/casting compound):	IP54
Protection (mechanical):	IP10
Protection (switch):	IP67
Ambient temperature:	-5 °C to +40 °C
Duty cycle:	60 %

[1] Measured in the armature disk (2) area, centre, vertical centre axis.

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

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

CAUTION

The tension ability of the brake increases, above all when operating with reduced torques and / or in operation with overexcitation.
Due to the brake noise behaviour and for safety reasons, the rotor (3) must however be replaced at the latest when the air gap reaches 0.9 mm (see section on Maintenance, page 22).
If there is still a risk of the device wearing down to an air gap of 0.9 mm unnoticed, we recommend mounting a wear monitoring device (option dependent on Type).
When the air gap "a" > 2 mm (design with hand release) or "a" > 3.0 mm (design without hand release), the armature disk (2) will lie against the mechanical contacts, which causes a sudden drop in braking torque to 0 Nm and a risk of load crashes.

Brakes with reduced braking torque are

for Size 200:	100 Nm and 150 Nm designs
for Size 400, short:	210 Nm, 280 Nm and 350 Nm designs
for Size 400, long:	375 Nm and 450 Nm designs
for Size 600:	500 Nm design
for Size 800:	650 Nm design
for Size 1000:	920 Nm design

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Table 2: Technical Data

Size	Nominal torque [3] minimal	Overexcitation voltage 1.5 to 2 x U_N	Nominal voltages U_N with respective (inductivity)	Nominal power P (20 °C)	Rotor thickness New condition
200	**2 x 100 Nm**	no	24 V DC (2 x 2 H) 104 V DC (2 x 35 H) 180 V DC (2 x 100 H) 207 V DC (2 x 145H H)	2 x 74 W	18 $_{-0.05}$ mm
	2 x 150 Nm				
	2 x 200 Nm				
	2 x 220 Nm	yes			
	2 x 240 Nm				
400 short design	**2 x 210 Nm**	no	24 V DC (2 x 2 H) 104 V DC (2 x 40H) 180 V DC (2 x 120 H) 207 V DC (2 x 165 H)	2 x 93 W	18 $_{-0.05}$ mm
	2 x 280 Nm				
	2 x 350 Nm				
	2 x 410 Nm				
400 long design	**2 x 375 Nm**	no	24 V DC (2 x 2.5 H) 104 V DC (2 x 40 H) 180 V DC (2 x 120 H) 207 V DC (2 x 160 H)	2 x 92 W	18 $_{-0.05}$ mm
	2 x 450 Nm				
	2 x 480 Nm	yes			
	2 x 550 Nm				
600	**2 x 500 Nm**	no	24 V DC (2 x 3 H) 104 V DC (2 x 52 H) 180 V DC (2 x 150 H) 207 V DC (2 x 200 H)	2 x 86 W	18 $_{-0.05}$ mm
	2 x 590 Nm				
	2 x 670 Nm	yes			
600 long design	**2 x 780 Nm**	yes	24 V DC (2 x 3 H) 104 V DC (2 x 50 H) 180 V DC (2 x 145 H) 207 V DC (2 x 200 H)	2 x 96 W	20 $_{-0.05}$ mm
800	**2 x 650 Nm**	no	24 V DC (2 x 3 H) 104 V DC (2 x 46 H) 180 V DC (2 x 130 H) 207 V DC (2 x 170 H)	2 x 118 W	20 $_{-0.05}$ mm
	2 x 830 Nm				
	2 x 930 Nm	yes			
1000	**2 x 920 Nm**	no	24 V DC (2 x 2.5 H) 104 V DC (2 x 46 H) 180 V DC (2 x 125 H) 207 V DC (2 x 170 H)	2 x 121 W	20 $_{-0.05}$ mm
	2 x 1015 Nm				
	2 x 1200 Nm	yes			

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

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Table 3: Technical Data

Size	Nominal torque minimal	Max. trigger speed	Max. friction work on EMERGENCY STOP per brake circuit [4]	Tightening torque for fixing screw Item 5	Release force per brake circuit		Release angle	Weight
					Bowden cable	Hand release lever		
200	2 x 100 Nm	820 rpm	20000 J	24 Nm	approx. 110 N	approx. 70 N	13°	24 kg
	2 x 150 Nm				approx. 165 N	approx. 105 N		
	2 x 200 Nm				approx. 200 N	approx. 140 N		
	2 x 220 Nm	820 rpm	20000 J	24 Nm	approx. 230 N	approx. 155 N	13	27 kg
	2 x 240 Nm				approx. 260 N	approx. 165 N		
400 short design	2 x 210 Nm	710 rpm	30000 J	48 Nm	approx. 210 N	approx. 135 N	15°	36.6 kg
	2 x 280 Nm				approx. 270 N	approx. 170 N		
	2 x 350 Nm				approx. 345 N	approx. 220 N		
	2 x 410 Nm				approx. 410 N	approx. 260 N		
400 long design	2 x 375 Nm	500 rpm	30000 J	48 Nm	approx. 355 N	approx. 225 N	15°	40.7 kg
	2 x 450 Nm				approx. 440 N	approx. 280 N		
	2 x 480 Nm	500 rpm	30000 J	48 Nm	approx. 470 N	approx. 300 N	15°	43.5 kg
	2 x 550 Nm				approx. 490 N	approx. 315 N		
600	2 x 500 Nm	500 rpm	35000 J	83 Nm	approx. 445 N	approx. 280 N	15°	51.6 kg
	2 x 590 Nm				approx. 525 N	approx. 335 N		
	2 x 670 Nm				approx. 610 N	approx. 390 N		
600 long design	2 x 780 Nm	500 rpm	35000 J	83 Nm	approx. 620 N	approx. 400 N	15°	61.9 kg
800	2 x 650 Nm	400 rpm	40000 J	83 Nm	approx. 370 N	approx. 235 N	15°	66.5 kg
	2 x 830 Nm				approx. 475 N	approx. 300 N		
	2 x 930 Nm				approx. 540 N	approx. 345 N		
1000	2 x 920 Nm	400 rpm	45000 J	200 Nm	approx. 470 N	approx. 300 N	15°	83 kg
	2 x 1015 Nm				approx. 530 N	approx. 340 N		
	2 x 1200 Nm				approx. 610 N	approx. 390 N		

[4] 1 brake circuit brakes / max. 3 movements one after the other with a 5-minute break each time

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Table 4: Switching Times [ms]

Size	Nominal torque minimal	Attraction t_2	Attraction t_2 on overexcitation	Drop-out t_0 DC	Drop-out t_{50} [5] DC	Drop-out t_{90} [6] DC	Drop-out t_{11} AC	Drop-out t_1 AC
200	2 x 100 Nm	140	–	100	160	230	600	950
	2 x 150 Nm	180	–	80	125	180	350	800
	2 x 200 Nm	195	–	50	110	160	280	670
	2 x 220 Nm	–	115	35	85	140	150	400
	2 x 240 Nm	–	115	30	80	135	150	400
400 short design	2 x 210 Nm	240	–	135	185	240	800	1200
	2 x 280 Nm	310	–	75	140	210	270	800
	2 x 350 Nm	350	–	50	120	180	235	675
	2 x 410 Nm	450	–	50	90	160	190	400
400 long design	2 x 375 Nm	295	–	40	75	135	385	870
	2 x 450 Nm	320	–	35	65	120	200	700
	2 x 480 Nm	400	–	30	60	115	160	600
	2 x 550 Nm	–	165	40	75	120	150	550
600	2 x 500 Nm	400	–	85	140	185	500	900
	2 x 590 Nm	500	–	40	90	160	350	790
	2 x 670 Nm	–	230	50	110	190	240	650
600 long design	2 x 780 Nm	–	260	40	100	170	200	960
800	2 x 650 Nm	300	–	80	145	170	540	1070
	2 x 830 Nm	450	–	50	100	140	400	950
	2 x 930 Nm	–	240	45	115	160	250	850
1000	2 x 920 Nm	360	–	80	125	180	530	1250
	2 x 1015 Nm	490	–	55	100	170	400	1100
	2 x 1200 Nm	–	260	50	130	210	250	900

[5] Referring to the nominal braking torque

[6] 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.

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Torque-Time Diagram

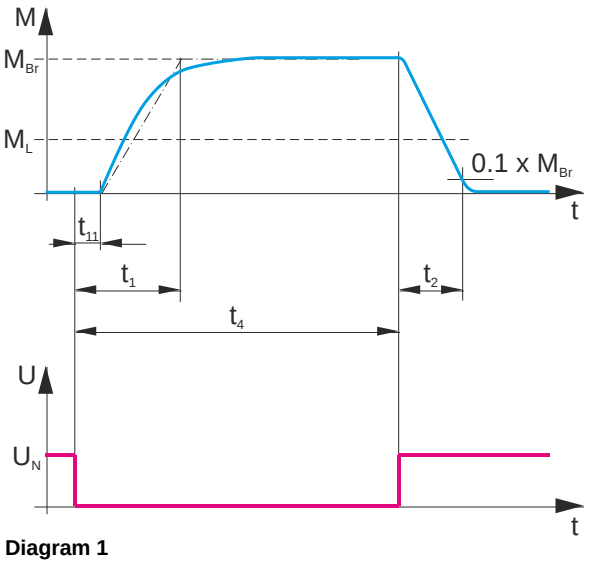

Diagram 1
Switching times for brake operation with nominal voltage

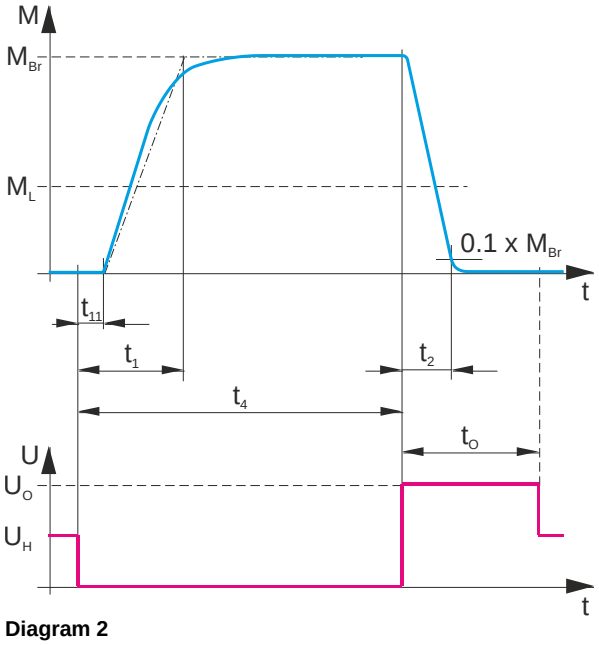

Diagram 2
Switching times for brake operation with overexcitation voltage

Key

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

Application

- ROBA®-duplostop® for use as a holding brake with occasional EMERGENCY STOP braking actions
- The max. permitted speed and friction work (see Technical Data, Table 3) must be observed.

Design

The ROBA®-duplostop® is a spring applied, electromagnetically releasing dual circuit safety brake - a component in terms of DIN VDE 0580.
It is designed for installation into gearless elevator machinery for use as a holding brake with occasional EMERGENCY STOP braking actions.
On dimensioning, the braking torque, the speed as well as the permitted friction work in case of EMERGENCY STOP need to be taken into consideration for safe holding of the load torque and safe compliance with the required braking distance.
Furthermore, the ROBA®-duplostop® 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

ROBA®-duplostop® brakes are spring applied, electromagnetic safety brakes.

Spring applied function:
In de-energised condition, thrust springs press against the armature disks (2). The rotor (3) with the friction linings is therefore held between the armature disks (2) and the machine screw-on surface.
The motor shaft is braked via the rotor (3).

Electromagnetic function:
Due to the magnetic force of the coils in the coil carriers (1), the armature disks (2) are attracted against the spring pressure to the coil carrier (1).
The brake is thereby released and the shaft can rotate freely.

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

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Scope of Delivery / State of Delivery

The brake bodies are completely pre-assembled with coil carrier (1), armature disks (2), distance bolts (4), hand release (option dependent on Type) and adjusted microswitches (option dependent on Type). The following are included loose in delivery: the rotor (3), the hexagon head screws (5) for securement of the brakes, as well as - if applicable - the hub (15) with O-ring (16).

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

Adjustment

The brakes are equipped manufacturer-side with the respective springs for the braking torque stated on the Type tag (14). 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 microswitches are also adjusted manufacturer-side. Despite great care during the manufacturer-side adjustment, re-adjustment might be necessary after installation due to transportation and handling. Furthermore, such switches cannot be considered fail-safe. Please observe the sections Release Monitoring and Wear Monitoring.

Installation Conditions

- ❒ The eccentricity of the shaft end in relation to the fixing holes must not exceed 0.3 mm.
- ❒ The positional tolerance of the threads for the cap screws (5) must not exceed 0.3 mm.
- ❒ The axial run-out deviation of the screw-on surface to the shaft must not exceed the permitted axial run-out tolerance of 0.063 mm in the area of the friction surface.
  Measuring procedure acc. DIN 42955.
  The shaft bearing is to be designed so that the axial backlash of the shaft (absolute) does not exceed the permitted axial run-out value during operation.
  Larger deviations can lead to a drop in torque, to continuous grinding of the rotor (3) and to overheating.
- ❒ The toothed motor shaft should be designed according to the information given in the applicable assembly drawing.
  The O-ring groove must be inserted before the shaft is splined. The O-ring groove must be free of burrs.

The dimensions stated in the assembly drawings are manufacturer-side recommendations.

- ❒ On hub designs the tolerances of the hub bore (15) and the shaft must be selected so that the hub toothing (15) is not widened. Widening of the toothing leads to the rotor (3) jamming on the hub (15) and therefore to brake malfunctions.
  Recommended hub – shaft tolerance H7/k6.
  If the hub (15) is heated for better joining, the O-ring (16) must be removed beforehand and re-mounted after hub installation.
  The max. permitted joining temperature of 200 °C must not be exceeded.
- ❒ Dimensioning of the key connection according to the requirements shaft diameter, transmittable torque and operating conditions must be carried out. For this, the corresponding user data must be known or the customer must carry out the dimensioning according to the valid calculation basis DIN 6892.
  For the calculation, a hub quality of Re = 300 N/mm^2 should be used.
  The length of the key should lie over the entire hub (15).
- ❒ For the dimensioning of the key connections, the permitted tensions common in machine construction must be considered.
- ❒ The mounting dimensions and the tapped holes s with depth K + 2 mm (K = screw projection) must be provided according to the Catalogue or the applicable assembly drawing (Fig. 8).
- ❒ 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 = 0.8 – 1.6 µm. The mounting surface must be turned. The surface must be bare or FE-phosphated (layer thickness approx. 0.5 µm) without oil.
  If corrosion protection is applied, the device must be inspected for possible effects on the braking torque.
  In particular customer-side mounting surfaces made of grey cast iron are to be rubbed down additionally with sandpaper (grain ≈ 60 to 100).
- ❒ The rotor and brake surfaces must be oil and grease-free.
- ❒ The O-ring (8) or O-ring (16) must be lightly greased.
- ❒ The toothings of the motor shaft rotor (3) and the hub (15) must not be oiled or greased.
- ❒ Please abstain from using cleaning agents containing solvents, as they could affect the friction material.

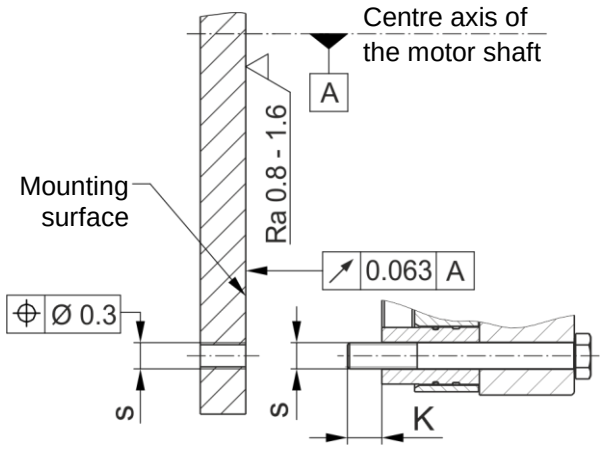

Fig. 8

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Installation: Design for Splined Motor Shaft (Figs. 1 - 2a and 3 - 8)

1. Insert the O-ring (8), lightly greased, acc. Parts List with NBR 70 material (provided by customer) into the motor shaft groove. Please use a grease based on mineral oil, NLGI Class 2, with a basic oil viscosity of 220 mm^2/s at 40 °C.
2. Push the rotor (3) onto the motor shaft by hand using light pressure.
   Please make sure that the rotor collar
   Ø 90 on Size 200,
   Ø 110 on Size 600,
   Ø 124 on Size 800 and
   Ø 135 on Size 1000 faces the machine wall.
   The installation direction is immaterial for Size 400 because the rotor (3) is symmetrical.
   On special designs, the rotor collar must be aligned according to the applicable assembly drawing.
   Make sure that the toothing moves easily.
   Do not damage the O-ring.
3. Evenly attach the left brake body with hexagon head screws (Item 5; 4 pieces) (we recommend that you secure the screws using Loctite 243).
   Tighten the hexagon head screws using a torque wrench and observe the tightening torque acc. Table 3.
   Repeat the procedure with the brake body on the right side.
4. **Check air gap “a” (Fig. 2a):**
   Air gap: 0.40 mm ≤ “a” ≤ 0.65 mm
   This air gap must be given in the armature disk (2) area, centre, vertical centre axis next to the microswitch (6.1) (Fig. 1).
5. Connect the brake electrically.
6. **Check air gap “b” > 0.25 mm in energised state on the rotor (3) (Fig. 2a).**
   The inspection air gap must be given.

Installation: Hub Design (Figs. 1 and 2b - 8)

1. Mount the hub (15) with the inserted O-ring (Item 16 / **O-ring 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).
2. Push the rotor (3) over the O-ring (16) onto the hub (15) by hand using light pressure.
   Please ensure that the direction of the rotor collar is aligned according to the applicable assembly drawing.
   Make sure that the toothing moves easily.
   Do not damage the O-ring.
3. Evenly attach the left brake body with hexagon head screws (Item 5; 4 pieces) (we recommend that you secure the screws using Loctite 243).
   Tighten the hexagon head screws using a torque wrench and observe the tightening torque acc. Table 3.
   Repeat the procedure with the brake body on the right side.
4. **Check air gap “a” (Fig. 2b):**
   Air gap: 0.40 mm ≤ “a” ≤ 0.65 mm
   This air gap must be given in the armature disk (2) area, centre, vertical centre axis next to the microswitch (6.1) (Fig. 1).
5. Connect the brake electrically.
6. **Check air gap “b” > 0.25 mm in energised state on the rotor (3) (Fig. 2b).**
   The inspection air gap must be given.

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Hand Release (7)

(Option dependent on Type for mechanical release of both brake circuits individually using a Bowden cable or by hand)

The hand release is set manufacturer-side ready for installation.

The brake is released by moving both hand release levers simultaneously (7.1), see Figs. 5 and 6.
The rotational direction is irrelevant here.
The armature disks (2) are attracted to the coil carriers (1); the rotor (3) is then free and the brake is released.

DANGER

Please operate the hand release carefully.
Any existing loads are put into motion when the hand release is actuated.
Please see Table 3 for the required release force.

Do not push the hand release lever (7.1) up to the stop pins (spring pins Item 7.2), but carefully only to the point, at which the traction sheave or the car starts moving.

The stop pins are only used to prevent blockage of the hand release.

A substantially increased force acting on the hand release lever (7.1) may lead to component destruction.

Bowden cable designs must be designed with an end stop for the Bowden cable lever as soon as release of the brake is residual torque-free.

In addition, a suitable return spring must be installed on Bowden cable designs by the customer in order to compensate for friction forces in the Bowden cable.

Adjust the Bowden cable length so that the hand release lever (6.1), after actuation, pivots back to the unreleased neutral position.

When actuating the hand release, a switching signal of the release monitoring device cannot be guaranteed.

The hand release is subject to wear and is not suitable for constant release.
A sufficient number of emergency releases is possible (approx. 1000 x).

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 (see Table 3). This process is to be carried out at reduced speed, approx. 30 % of the operating speed.
If the bedding in should take place under works-specific conditions, we ask you to contact us, so that we can provide the appropriate parameters.
Friction materials develop their optimum effect only under speed at the appropriate contact pressure, as continuous regeneration of the friction surface then takes place (torque consistency). Permanent grinding of the rotor can lead to overheating / damage to the brake linings, and therefore to a drop in braking torque.
Furthermore, friction materials are subject to ageing, which is also influenced, among other things, by higher temperatures and other ambient influences. We recommend regular inspection of the braking torque (1 x per year) including the respective dynamic braking actions as a refresher.

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.

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Release Monitoring (6) Fig. 9
(Option, dependent on Type)

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

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

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

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

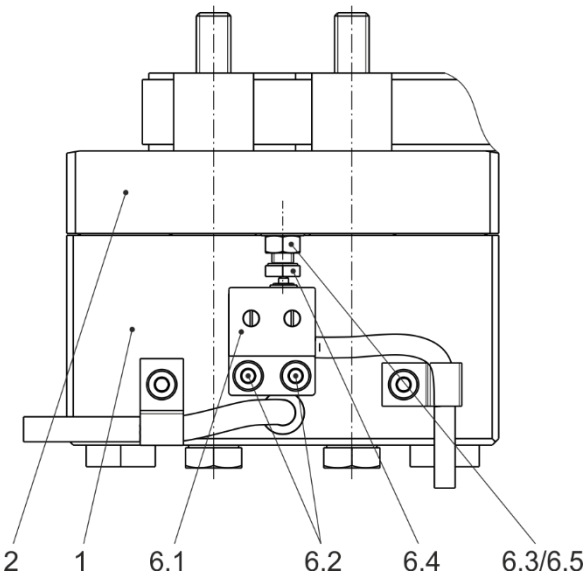
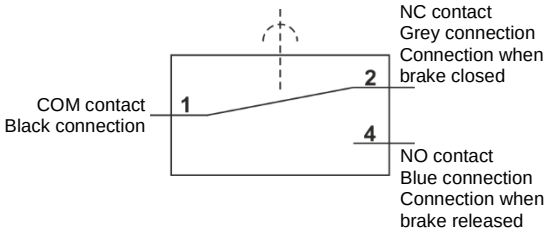


Fig. 9

Function
When the magnetic coils are energised in the coil carriers (1), the armature disks (2) are attracted to the coil carrier (1). The microswitches (6.1) emit a signal and the brake is released.

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 on both circuits:

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!

If a replacement or new adjustment of the microswitch (6.1) is required by the customer, separate adjustment instructions stating the article or serial number of the respective brake can be requested from the manufacturer.

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Wear Monitoring (9) Figs. 7 and 10
(Option, dependent on Type)

Only one microswitch for wear monitoring (9) is required per ROBA®-duplostop® brake, which is mounted onto the right brake (Figs. 7 and 10).
The ROBA®-duplostop® brake is supplied with manufacturer-side adjusted wear monitoring (9).

Function

Due to wear on the rotor (3), the air gap “a” between the coil carrier (1) and the armature disk (2) increases.
Once the maximum air gap of 0.9 mm has been reached, the microswitch (9.1) contact switches over and emits a signal.
The rotor (3) must be replaced.

The customer is responsible for a signal evaluation.

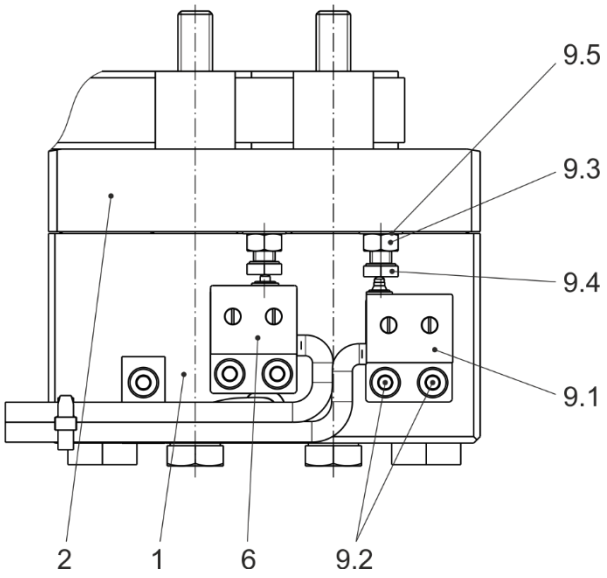
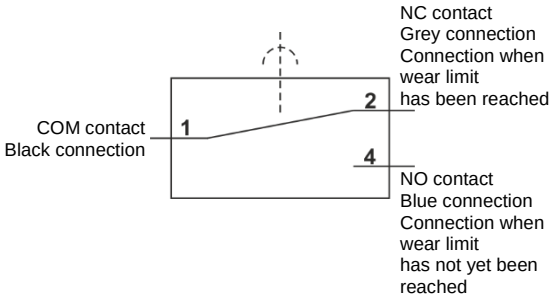


Fig. 10

Wiring Diagram:



If a replacement or new adjustment of the microswitch (9.1) is required by the customer, separate adjustment instructions stating the article or serial number of the respective brake can be requested from the manufacturer.

For switch power values, please see Release Monitoring

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

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Electrical Connection and Wiring for Operation with Nominal Voltage (without Overexcitation)

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

Supply Voltage Requirements

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

Grounding Connection

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

Device Fuses

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

Switching Behaviour

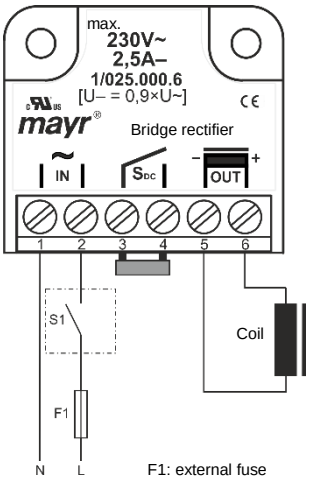
The reliable operational behaviour of a brake is to a large extent dependent on the switching mode used. Furthermore, the switching times are influenced by the temperature and the air gap between the armature disk and the coil carrier (dependent on the wear condition of the linings).

Magnetic Field Build-up

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

Magnetic Field Removal

AC-side switching



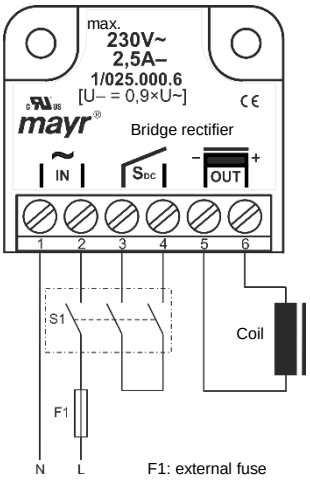
F1: external fuse

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

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

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

DC-side Switching



F1: external fuse

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

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

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

Protection Circuit

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

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Electrical Connection and Wiring for Operation with Overexcitation

DC current is necessary for operation of the brake. The coil nominal 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). The brake must only be operated with overexcitation (e.g. using a ROBA®-switch or -multiswitch fast acting rectifier or phase demodulator). 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.

Grounding 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.

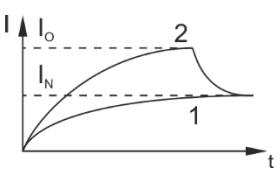
Field build-up with normal excitation

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.

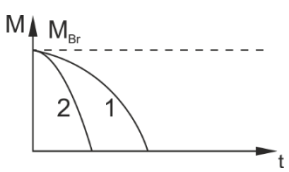
Field Build-up with Overexcitation

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

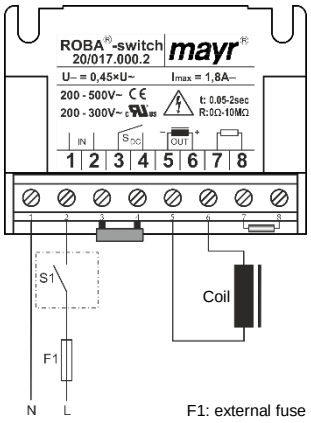


Braking torque path



Magnetic Field Removal

AC-side switching



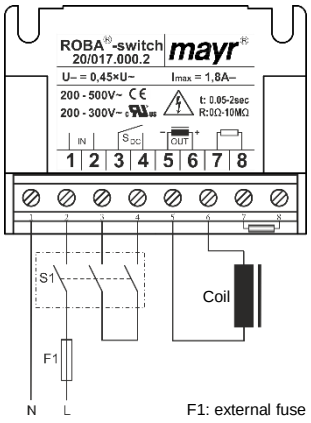
F1: external fuse

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



F1: external fuse

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 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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Brake Inspection

(Customer-side after Mounting onto the Elevator Machinery)

- ❑ **Individual air gaps inspection (Figs. 2a/b)**
  Air gaps “a” of both brake circuits (brake de-energised):
  Air gap 0.40 mm ≤ “a” ≤ 0.65 mm. This air gap must be given in the armature disk (2) area, centre, vertical centre axis next to the microswitch (6.1) (Fig. 1).

  Air gaps “b” of both brake circuits (brake energised):
  air gap “b” > 0.25 mm.
- ❑ **Braking torque inspection:**
  Please compare the requested braking torque with the torque stated on the Type tag.
- ❑ **Release function inspection**
  By energising the brake via battery operation, to guarantee emergency escape for passengers during a power failure or manually using the hand release.
- ❑ **Switch function inspection of the release monitoring (NO contact)**
  Brake de-energised ➔ Signal “OFF”
  Brake energised ➔ Signal “ON”
- ❑ **Hand release functional inspection (dependent on Type)**

Dual Circuit Brake Functional Inspection

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

DANGER

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

The individual circuit inspection is carried out by energising the individual circuits. The braking effect sufficient for the retardation of the elevator cage, which is loaded with nominal load and moving downwards at nominal speed, must be maintained (please observe the permitted friction work acc. Technical data).

Inspection left brake circuit:

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

Inspection right brake circuit:

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

Inspection of both brake circuits:

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

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Maintenance

ROBA®-duplostop® 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 rotor: in particular the exterior appearance of the brake surfaces
     - wear
     - free of oil / lubricants
     - sticking of linings
2. Tightening torque inspection of the fixing screws on the brakes. If the brake fixing screws are covered with sealing lacquer, a visual inspection for damage of the sealing is sufficient.
3. Inspection of the air gap – braked (both brake circuits)
4. Inspection of toothing backlash from the splined motor shaft (or the hub (15)) to the rotor (3).
   Max. permitted toothing backlash 0.5 °
5. Running noise (brake rotor) during operation
   Attention: Permanent grinding of the rotor 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 rotor replaced if required independent of the inspection or the determined wear value!
6. Braking torque or delay inspection (individual brake circuits) at least once per year (within the scope of the maintenance / main inspection)

In order to inspect the wear condition of the rotor (3), please measure the air gap “a”, see Figs. 2a/b.
If the brake limit air gap (0.9 mm) has been reached, meaning that the friction linings are worn down, the braking torque is lost and the rotor (3) must be replaced.
Brake de-installation is carried out by following the instructions in the section Installation (page 16) backwards.

Replacing the Rotor (3)

Before Replacing the Rotor

❑ Clean the brake.

Please observe the section “Cleaning the Brake”, see below.

❑ Measure the rotor thickness “new” (nominal dimension acc. Table 2).

Replace the rotor (3) by following the Brake Installation instructions backwards.

DANGER

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

Information on the Components

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

Possible hazards:
No potential dangers have been recognised so far when the brake is used according to its intended purpose. When grinding in the 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 behaviour:
Do not inhale dusts.
Vacuum the dusts at the point of origin (tested suction devices, tested filters acc. DIN EN 60335-2-69 for dust classes H; maintenance of the suction devices and filter replacement at regular intervals).
If local dust suction is not possible or is insufficient, the entire work area must be ventilated using appropriate technology.

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

Cleaning the Brake

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

❒ 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.

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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)

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/couplings) 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.

Malfunctions / Breakdowns:

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

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