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

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.

Contents:

Declaration of Conformity

A conformity evaluation for the applicable EU directives has been carried out for this product. The conformity evaluation is set out in writing in a separate document and can be requested if required. It is forbidden to start use of the product until you have ensured that all applicable EU directives and directives for the machine or system into which the product has been installed have been fulfilled.
Without a conformity evaluation, this product is not suitable for use in areas where there is a high danger of explosion. This statement is based on the ATEX directive.

Safety and Guideline Signs

Danger!
Danger of injury to personnel and damage to machines.

Please Observe!
Guidelines on important points.

TÜV (German Technical Inspectorate) Certification

License number: **ABV 766/2**

Please Observe!
According to German notation, decimal points in this document are represented with a comma (e.g. 0,5 instead of 0.5).

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Safety Regulations

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

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

To prevent injury or damage, only professionals and specialists should work on the devices.

Danger!

This warning applies if:

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

Please Observe!
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.

Please Observe!

- ❒ Only specialists who are trained in the transport, installation, operation, maintenance and general operation of these devices and who are aware of the relevant standards should be allowed to carry out this work.
- ❒ Technical data and specifications (Type tags and documentation) must be followed.
- ❒ The correct connection voltage must be connected according to the Type tag.
- ❒ Never loosen electrical connections or carry out installations, maintenance or repairs while the voltage connection is energised!
- ❒ Cable connections must not be placed under mechanical strain.
- ❒ Check electrical components for signs of damage before putting them into operation. Never bring them into contact with water or other fluids.
- ❒ The braking torque is lost if the friction lining and / or the friction surface come into contact with oil or grease.

Please Observe!
Please ensure that the brake is clean and oil-free, as both brake circuits have an effect on the same linings. Special sealing measures, among other precautions, may be necessary - in particular in gear applications!

Appointed Use

This safety brake is intended for use in electrically operated elevators and goods elevators according to EC 81-1/1998.
The safety brake corresponds to DIN EN 81, Part 1 [Sections 12.4.2.1 (2nd Paragraph), 12.4.2.2, and 12.4.2.5] in its general design and its mode of operation.
The effectiveness of the mechanical dual circuit system can be tested at the place of operation (requirement acc. TRA 102).

Guidelines for Electromagnetic Compatibility (EMC)

In accordance with the EMC directives 2004/108/EC, 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.

Device Conditions

Please Observe!
When dimensioning the brakes, please remember that installation situations, braking torque fluctuations, permitted friction work, run-in behaviour 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.

Please Observe!

- ❒ Mounting dimensions and connecting 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 magnetic coils are designed for a duty cycle of 100 %. However, a duty cycle > 60 % leads to increases in temperature which cause premature aging of the noise damping and therefore an increase in switching noises. The max. permitted switching frequency is 240 1/h. On overexcited brakes, the switching frequency must not exceed 180 1/h.
  These values apply for an intermittent duty S3 60%.
  The permitted surface temperature on the brake flange must not exceed 80 °C at a max. ambient temperature of 45 °C.
  The overexcitation time span should be c. 600 ms on sizes 200 to 400 and c. 1 s for sizes 600 to 1000.
- ❒ 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.
- ❒ The braking torque is dependent on the present run-in condition of the brakes.
- ❒ Manufacturer-side corrosion protection of the metallic surface is provided. The surface is rough sawn and not machined (milled material).

Protection Class I

This protection can only be guaranteed if the basic insulation is intact and if all conductive parts are connected to the PE conductor of the permanent installation. Should the basic insulation fail, the contact voltage cannot remain (VDE 0580).

Ambient Temperature 0 °C up to +45 °C

Danger!
At temperatures of around or under freezing point, condensation can strongly reduce the torque. During longer downtimes, the friction linings can stick to the friction surfaces. The user is responsible for taking appropriate counter measures.

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Insulation Material Class F (+155 °C)

The magnetic coil and the casting compound are suitable for use up to a maximum operating temperature of +155 °C.

Brake Storage

- ❑ Store the brakes in a horizontal position, in dry rooms and dust and vibration-free.
- ❑ Relative air humidity < 60 %.
- ❑ Temperature without major fluctuations within a range from – 20 °up to +60°C.
- ❑ Do not store in direct sunlight or UV light.
- ❑ Do not store aggressive, corrosive substances (solvents / acids / lyes / salts etc.) near to the brakes.

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

Handling

Before installation, the brake must be inspected and found to be in proper condition. The brake function must be inspected both once installation 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 and catapulted objects.
- ❒ Place a cover on the magnetic part to protect against injury through high temperatures.
- ❒ Protect against electric shocks by installing a conductive connection between the magnetic component and the PE conductor on the permanent installation (Protection Class I) and by carrying out a standardised inspection of the continuous PE conductor connection to all contactable metal parts.
- ❒ Protect against highly inductive switch-off peaks by installing varistors, spark quenching units or similar devices according to VDE 0580/2000-07, Paragraph 4.6, to prevent damage to the coil insulations or switch contact consumption in extreme conditions (this protection is contained in *mayr*® rectifiers).
- ❒ Take precautions against freeze-up of the armature disk and the rotor in high humidity and at low temperatures.

Regulations, Standards and Directives Used:

DIN VDE 0580	Electromagnetic devices and components, general directives
2006/95/EC	Low voltage directive
2004/108/EC	EMC directive
95/16/EC	Elevator directive
EN 81-1	Safety regulations for construction and installation of elevators and small goods elevators
BGV C1	(previously VGB 70) Safety regulations for theatre stage technical systems

Please Observe the Following Standards:

DIN EN ISO 12100-1 and 2	Machine Safety
DIN EN 61000-6-4	Noise emission
EN12016	Interference resistance (for elevators, escalators and moving walkways)
EN 60204	Electrical machine equipment

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 delivery conditions.
- ❒ Mistakes or deficiencies are to be reported to *mayr*® at once!

Conformity Markings

The product confirms to the CE according to the low voltage directive 2006/95/EC

Identification

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

Manufacturer

***mayr*®**

Name/Type

Article number

Serial number

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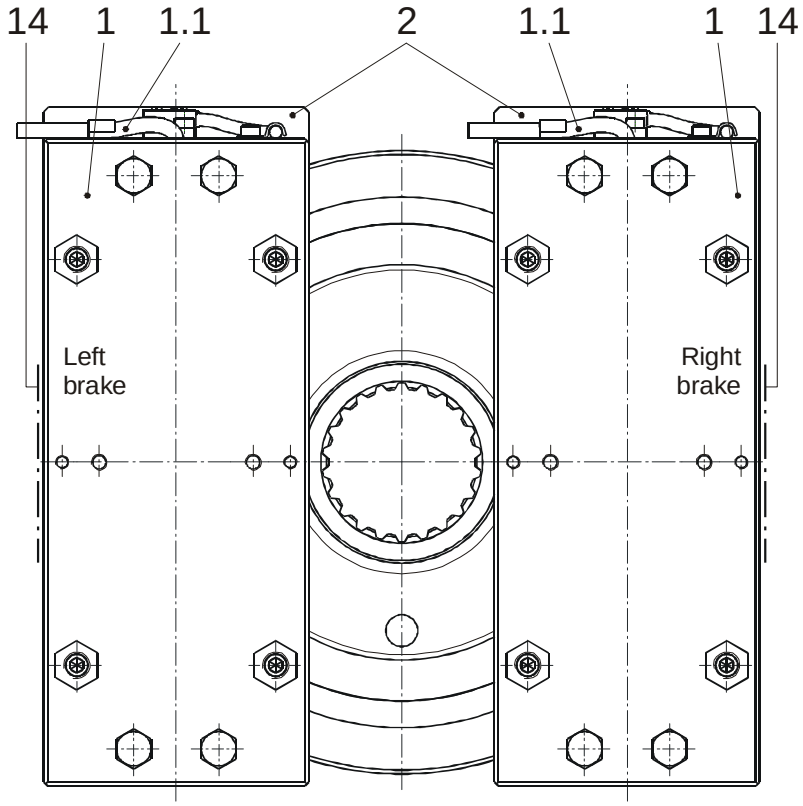

Fig. 1

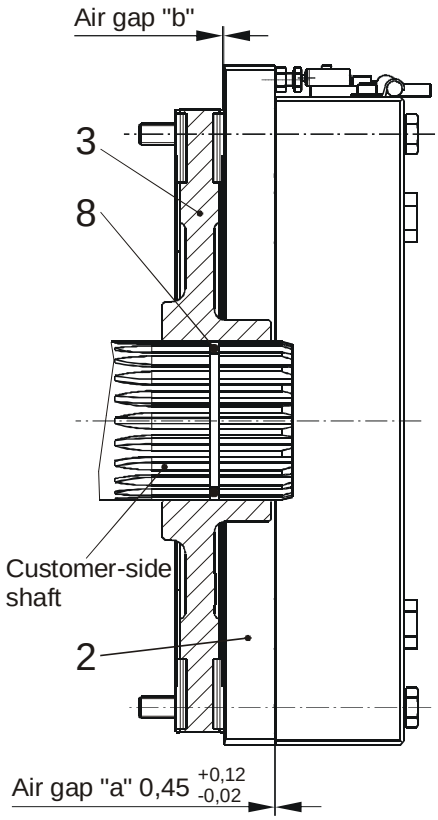

Fig. 2a

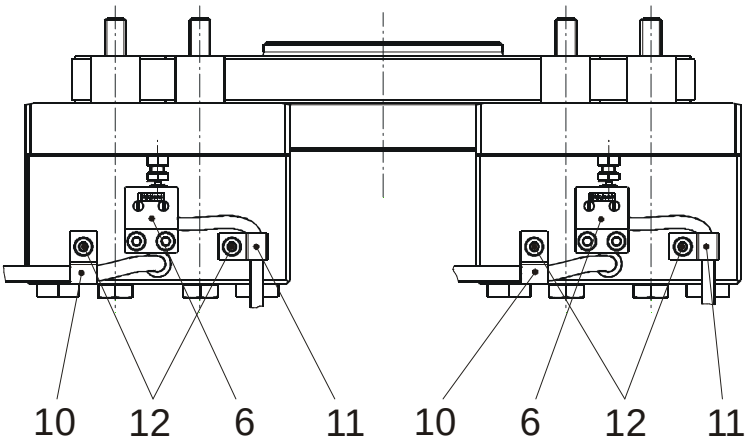

Fig. 3

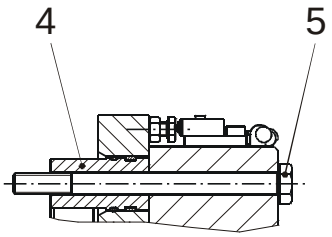

Fig. 4

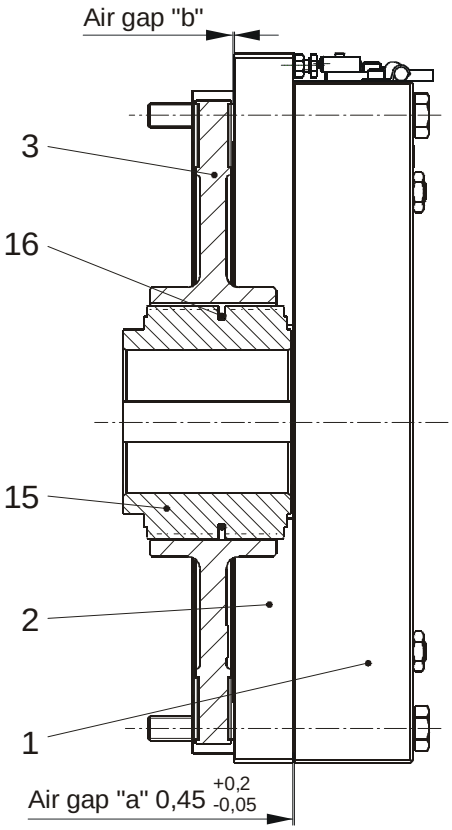

Fig. 2b

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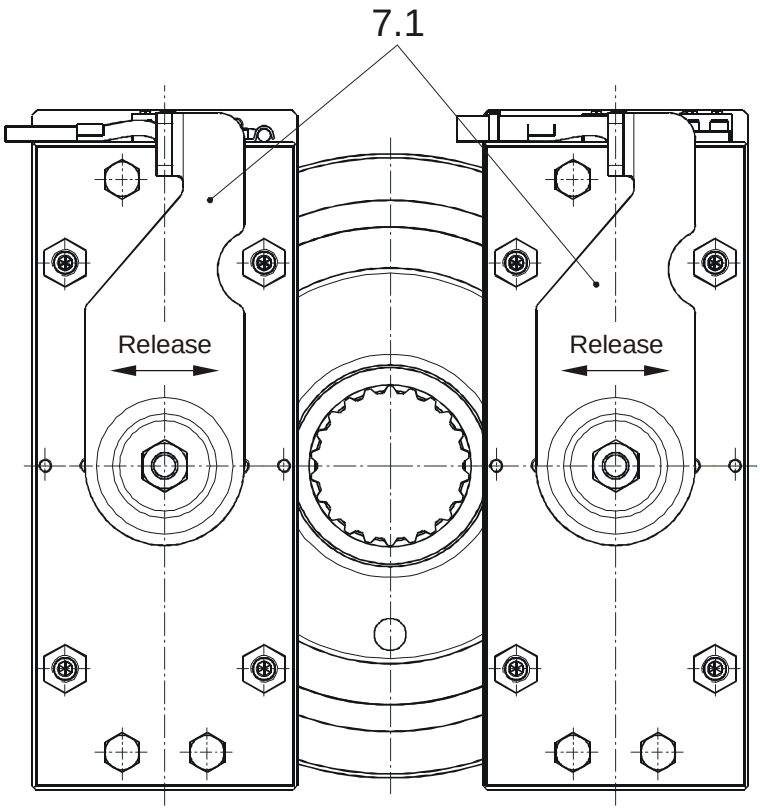

Fig. 5

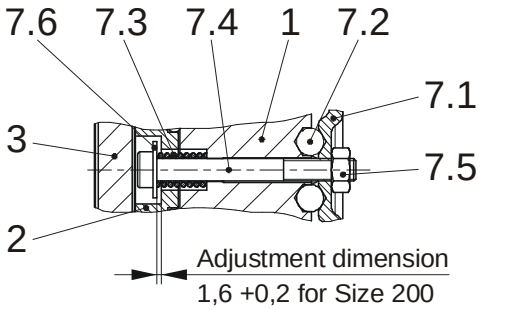

Fig. 6

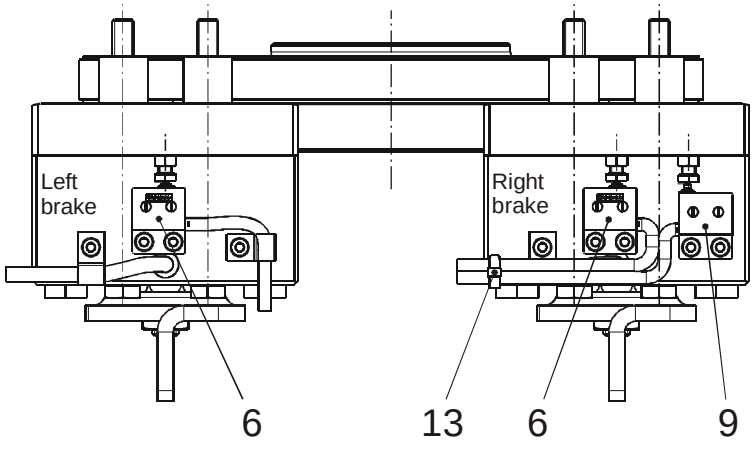

Fig. 7

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Parts List

(Only use mayr® original parts)

Item	Name	
1	Coil carrier assembly (inc. magnetic coils)	
1.1	Connection cable 2-wire; Connection coil blue/brown	
2	Armature disk	
3	Rotor	
4	Distance bolts	
5	Hexagon head screw, strength 8.8. DIN 931:	
	For Size 200 (100 Nm / 150 Nm / 200 Nm design):	M8x100
	For Size 200 (250 Nm/ 280 Nm design):	M8x110
	For Size 400 (210 Nm / 275 Nm / 350 Nm / 420 Nm design):	M10x110
	For Size 400 (375 Nm / 450 Nm design):	M10x110
	For Size 400 (550 Nm / 600 Nm design):	M10x120
	For Size 600 (all designs):	M12x120
	For Size 800 (all designs):	M12x130
	For Size 1000 (all designs):	M16x130
6	Release monitoring assembly	
6.1	Microswitch inc. adapter plate (Fig. 10; page 12)	
6.2	Cap screw (Fig. 10; page 12)	
6.3	Hexagon nut (Fig. 10; page 12)	
6.4	Hexagon head screw (Fig. 10; page 12)	
6.5	Spring washer (Fig. 10; page 12)	
7	Hand release assembly	
7.1	Hand release lever	
7.2	Steel ball	
7.3	Thrust spring	
7.4	Cap screw	
7.5	Hexagon nut	
7.6	Washer	
8	O-ring NBR 70 (not included in delivery):	
	For Size 200 (all designs):	D48x3
	For Size 400 (210 Nm / 270 Nm / 350 Nm / 420 Nm design):	D55x3
	For Size 400 (375 Nm / 450 Nm / 550 Nm / 600 Nm design):	D60x3
	For Size 600 (all designs):	D60x3
	For Size 800 (650 Nm / 850 Nm design):	D67x3
	For Size 800 (950 Nm design):	D76x3
	For Size 1000 (920 Nm / 1050 Nm design):	D76x3
	For Size 1000 (1200 Nm design):	D82x3
9	Wear monitoring assembly	
9.1	Microswitch inc. adapter plate (Fig. 11; page 13)	
9.2	Cap screw (Fig. 11; page 13)	
9.3	Hexagon nut (Fig. 11; page 13)	
9.4	Hexagon head screw (Fig. 11; page 13)	
9.5	Spring washer (Fig. 11; page 13)	
10	Cable clamp D6 for coil cable	
11	Cable clamp D6 for microswitch cable	
12	Cap screw M4x8	
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 (Fig. 2)	0,45 $^{+0,20}_{-0,05}$ mm
Limit air gap [2] "a" for nominal torque (Fig. 2)	0,9 mm
Inspection air gap "b" on released brake (Fig. 2)	min. 0,25 mm
Protection (coil/casting compound):	IP54
Protection (mechanical):	IP10
Protection (switch):	IP67
Ambient temperature:	0 °C to +45 °C
Duty cycle:	60 %

[1] Measured in the armature disk (2) area, middle, vertical centre axis.
[2] **The nominal torque is given up to the limit air gap (0,9 mm).**

Danger!
The tension ability of the brake is larger, but the rotor (3) must be replaced at the latest when the air gap reaches 0,9 mm, also due to the brake noise behaviour. On brakes with reduced braking torque, with hand release and / or operating with overexcitation, unpermittedly high wear on the rotor (3) wear will not be noticed via the brake switching behaviour. As the magnetic coil is capable in this constellation of achieving a very large armature disk (2) tension path, unpermittedly high wear on the rotor (3) leads to relaxation of the thrust springs, which in turn causes a drop in braking torque. In extreme cases, the armature disks (2) may even contact the shoulder screws or the adjusting screw on the hand release (air gap 1,6 mm) which would lead to the braking torque being lost.
We therefore recommend an additional wear monitoring device (see page 14) for brakes with reduced braking torque, with hand release and/or operation with overexcitation.

Brakes with reduced braking torque are

For Size 200:	100 Nm and 150 Nm design	For Size 600:	500 Nm design
For Size 400, short:	210 Nm, 270 Nm, and 350 Nm design	For Size 800:	650 Nm design
For Size 400, long:	375 Nm and 450 Nm design	For Size 1000:	920 Nm design

Table 2: Technical Data

Size	Nominal torque [3] minimal	Overexcitation voltage 1,5 to 2 x U_{Nom}	Nominal voltage U_{Nom}	Nominal capacity P (20 °C)	Inductivity (207 V – coil)	Rotor thickness in new condition
200	**100 Nm**	No	24/104/180/207 V DC	2 x 74 W	85,5 H	18 $_{-0.05}$ mm
	150 Nm					
	200 Nm					
	250 Nm	Yes	24/104/180/207 V DC	2 x 74 W	85,5 H	18 $_{-0.05}$ mm
	280 Nm					
400 Short version	**210 Nm**	No	24/104/180/207 V DC	2 x 93 W	50 H	18 $_{-0.05}$ mm
	270 Nm					
	350 Nm					
	420 Nm					
400 Long version	**375 Nm**	No	24/104/180/207 V DC	2 x 92 W		18 $_{-0.05}$ mm
	450 Nm					
	550 Nm	Yes	24/104/180/207 V DC	2 x 92 W		18 $_{-0.05}$ mm
	600 Nm					
600	**500 Nm**	No	24/104/180/207 V DC	2 x 86 W	64,6 H	18 $_{-0.05}$ mm
	600 Nm					
	700 Nm	Yes	24/104/180/207 V DC	2 x 86 W	64,6 H	18 $_{-0.05}$ mm
600 Long version	**800 Nm**	Yes	24/104/180/207 V DC	2 x 96 W	64,6 H	20 $_{-0.05}$ mm
800	**650 Nm**	No	24/104/180/207 V DC	2 x 118 W		20 $_{-0.05}$ mm
	850 Nm					
	950 Nm	Yes	24/104/180/207 V DC	2 x 118 W		20 $_{-0.05}$ mm
1000	**920 Nm**	No	24/104/180/207 V DC	2 x 121 W		20 $_{-0.05}$ mm
	1050 Nm					
	1200 Nm	Yes	24/104/180/207 V DC	2 x 121 W		20 $_{-0.05}$ mm

[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 medium friction radius.

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Table 3: Technical Data

Size	Nominal torque minimal	Max. speed	Inspected max. speed in the elevator area as a prototype-inspected brake	Inspected max. friction work on EMERGENCY STOP per braking circuit [4]	Tightening torque fixing screw Item 5	Release force per braking circuit	Release angle	Mass
200	100 Nm	1200 rpm	810 rpm	20000 J	24 Nm	100 N	13 °	24 kg
	150 Nm					150 N		
	200 Nm					200 N		
	250 Nm	1200 rpm	810 rpm	20000 J	24 Nm	230 N	13 °	27 kg
	280 Nm					260 N		
400 Short version	210 Nm	1000 rpm	710 rpm	30000 J	48 Nm	200 N	15 °	36,6 kg
	270 Nm					230 N		
	350 Nm					300 N		
	420 Nm					400 N		
400 Long version	375 Nm	1000 rpm	1000 rpm	30000 J	48 Nm	325 N	15 °	40,7 kg
	450 Nm					390 N		
	550 Nm	1000 rpm	1000 rpm	30000 J	48 Nm	470 N	15 °	43,5 kg
	600 Nm							
600	500 Nm	800 rpm	500 rpm	35000 J	83 Nm	390 N	15 °	51,6 kg
	600 Nm					470 N		
	700 Nm					540 N		
600 Long version	800 Nm	800 rpm	500 rpm	35000 J	83 Nm	620 N	15 °	61,9 kg
800	650 Nm	600 rpm	400 rpm	40000 J	83 Nm	320 N	15 °	66,5 kg
	850 Nm					420 N		
	950 Nm					460 N		
1000	920 Nm	500 rpm	400 rpm	45000 J	200 Nm	410 N	15 °	83 kg
	1050 Nm					470 N		
	1200 Nm					530 N		

[4] Max. 3 movements one after the other with a 5-minute break each time

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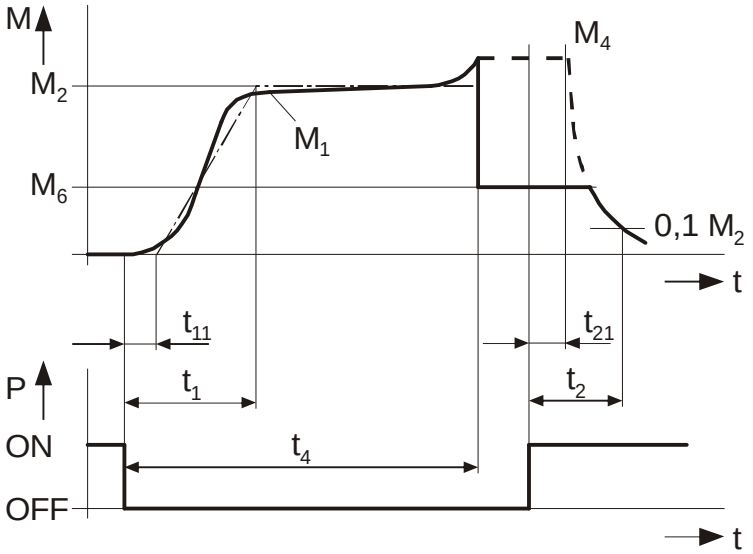
Table 4: Switching Times [ms]

Size	Nominal torque minimal	Tightening t_2	Tightening t_2 on overexcitation	Drop-out t_{11} AC	Drop-out t_1 AC	Drop-out t_{11} DC	Drop-out t_1 DC
200	100 Nm	140	–	600	950	90	190
	150 Nm	180	–	350	800	55	145
	200 Nm	195	–	280	670	38	115
	250 Nm	–	115	150	400	20	90
	280 Nm						
400 Short version	210 Nm	240	–	800	1200	100	250
	275 Nm	310	–	270	800	40	170
	350 Nm	350	–	235	675	30	145
	420 Nm	450	–	190	400	25	125
400 Long version	375 Nm	295	–	385	700	36	160
	450 Nm	320	–	200	870	30	140
	550 Nm	–	165	150	550	15	100
	600 Nm						
600	500 Nm	300	–	500	900	60	220
	600 Nm	390	–	350	790	42	180
	700 Nm	–	230	240	650	34	160
600 Long version	800 Nm	–	260	200	960	38	230
800	650 Nm	300	–	540	1070	60	240
	850 Nm	450	–	400	950	45	210
	950 Nm	–	240	250	850	35	180
1000	920 Nm	360	–	530	1250	70	260
	1050 Nm	490	–	400	1100	55	220
	1200 Nm	–	260	250	900	35	180

Please Observe!

- ❑ The use of varistors for spark quenching increases the DC-side switching times.
- ❑ At temperatures of around or under freezing point, condensation can strongly reduce the braking torque.
  The user is responsible for taking appropriate counter measures.
  The customer is responsible for providing a protective cover against contamination caused by construction sites.

Torque-Time Diagram



Key:

M_1 = Switching torque
M_2 = Nominal torque (characteristic torque)
M_4 = Transmittable torque
M_6 = Load torque
t_1 = Connection time
t_{11} = Response delay on connection
t_2 = Separation time
t_{21} = Response delay on separation
t_4 = Slipping time + t_{11}

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Design

The ROBA®-duplostop® is a spring applied, electromagnetically releasing dual circuit brake.
It is used for installation in a gearless elevator and serves as a brake assembly on the drive sheave shaft and as part of the protective assembly against excessive upward-moving cage speeds.

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 by the rotor (3).

Electromagnetic:
Due to the magnetic force of the coils in the coil carriers (1), the armature disk (2) is attracted against the spring force to the coil carrier (1).
The brake is 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.

State of Delivery

The brake bodies are partly assembled with coil carriers (1), armature disks (2), distance bolts (4), hand release (option, dependent on Type) and adjusted microswitches (option, dependent on Type). The rotor (3) and the hexagon head screws (5) for securing the brake are included loose in delivery.

Please check state of delivery!

Application

- ❑ **ROBA®-duplostop® for use as holding brakes with occasional EMERGENCY STOP braking actions.**
- ❑ **The max. permitted speeds and friction work, see Table 3, must be observed.**

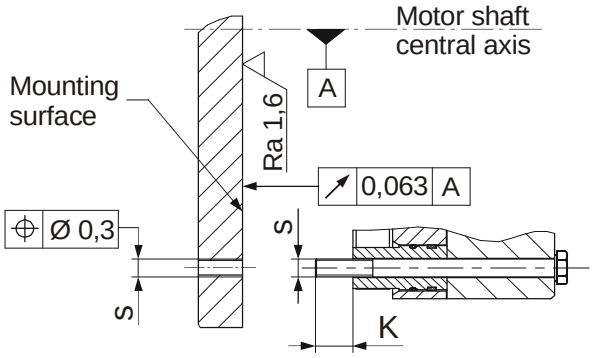

Fig. 8

Installation Conditions

- ❒ The eccentricity of the shaft end in relation to the fixing holes may not exceed 0,3 mm.
- ❒ The position tolerance of the threaded holes 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.
  Larger deviations can lead to a drop in torque, to continuous slipping on 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.

Please Observe!
The dimensions on the assembly drawings are manufacturer-side recommendations.

- ❒ On hub designs the hub bore (15) tolerances 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 ℃ mu st 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/mm2 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 screw-on surface s with depth K + 2 mm (K = screw projection) acc. Catalogue or applicable Assembly Drawing must be given (Fig. 8).
- ❒ The rotor 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 ≈ 200 – 400), or ideally with a sander.
- ❒ 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.

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Installation: Design with toothed motor shaft (Figs. 1 - 2a and 3 - 8)

1. Insert the O-ring (8, slightly greased, acc. Parts List with NBR 70 material (provided by customer) into the motor shaft groove. Please use NLGI Class 2 grease with a basic oil viscosity of 220 mm^2/s at 40 °C, e.g. Mobilgrease HP222.
2. Push the rotor (3) onto the motor shaft by hand using light pressure.
   Please ensure that the rotor collar
   Ø 90 for Size 200,
   Ø 110 for Size 600,
   Ø 124 for Size 800 and
   Ø 135 for Size 1000 is facing in the direction of 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 acc. the applicable Assembly Drawing.
   Check that the toothing moves easily.
   Do not damage the O-ring.
3. Secure the left brake body using hexagon head screws (Item 5, 4 pcs.) all round step-wise evenly (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.
   Then repeat this procedure with the right brake body.
4. **Check air gap "a" = 0,45 $^{+0,20}_{-0,05}$ mm**
   The nominal air gap must be given in the middle of the armature disk (2) area, vertical centre axis (Fig. 1).
5. **Check air gap "b" > 0,25 mm in energised state on the rotor (3) (Fig. 2).**
   The inspection air gap must be given.

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

1. Mount the hub (15) with the O-ring inserted (Item 16 / **O-ring must be lightly greased**) onto the shaft and bring it into the correct position (the length of the key should cover 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 acc. the applicable Assembly Drawing.
   Check that the toothing moves easily.
   Do not damage the O-ring.
3. Secure the left brake body using hexagon head screws (Item 5, 4 pcs.) all round step-wise evenly (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.
   Then repeat this procedure with the right brake body.
4. **Check air gap "a" = 0,45 $^{+0,20}_{-0,05}$ mm**
   The nominal air gap must be given in the middle armature disk (2) area, vertical centre axis (Fig. 1).
5. **Check air gap "b" > 0,25 mm in energised state on the rotor (3) (Fig. 2).**
   The inspection air gap must be given.

Hand release (7)

(Option dependent on Type for release using a Bowden cable)

The hand release is completely assembled manufacturer-side.
The brake is released when both hand release levers are moved simultaneously (7.1), see Fig. 5.
By lifting the hand release levers (7.1) up from the steel balls (7.2), both cap screws (7.4) incl. washers (7.6) together with the armature disk (2) are pulled against the coil carrier (1) (Fig. 9).
After this, the rotor (3) is free and the brake is released.

Danger!
Operate the hand release carefully.
Existing loads are put into motion when the hand release is activated.

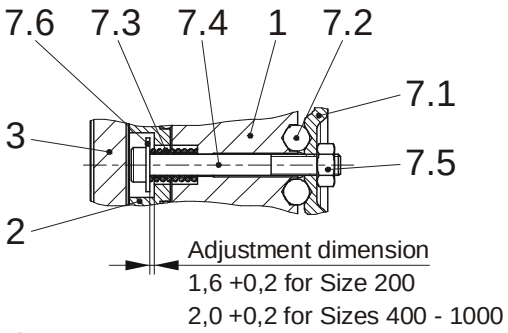

Fig. 9

Braking Torque Adjustment

ROBA®-duplostop® brakes are delivered adjusted to the braking torque required on order.

Noise damping

Please Observe!
The noise damping used here was set and adjusted manufacturer-side.
However, this component is subject to aging dependent on the application or operational conditions (torque adjustment, switching frequency, ambient conditions, system vibrations etc.) and must be re-adjusted or replaced as a routine measure or if the switching noise becomes too loud.
This must only be carried out by qualified and authorised specialist personnel, and should therefore be undertaken in the place of manufacture.

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Release Monitoring (6) Fig. 10
(Option, dependent on Type)

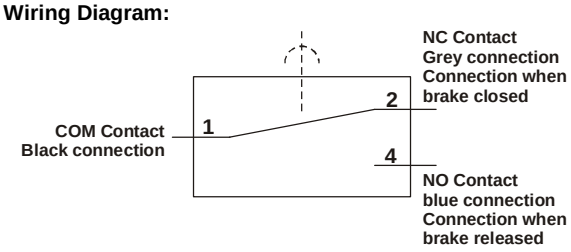
ROBA®-duplostop® brakes are delivered with one release monitoring (6) per brake circuit.
The microswitches (6.1) emit a signal for every brake condition change "signal brake opened or brake closed"

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.

Wiring Diagram:



Re-adjustment is possible via the hexagon head screws (6.4) and the hexagon nuts (6.3).
If this proves necessary, please contact the manufacturers.

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.

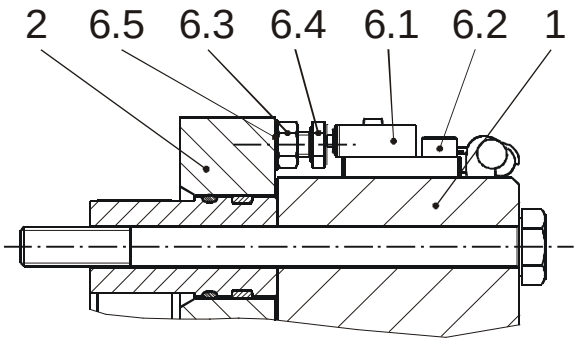


Fig. 10

Manufacturer-side Adjustment and Functional Inspection of the Microswitches (6.1), see Fig. 10:
Brake mounted and secured with the nominal torque.

Danger!
Brake must not be energised.

1. Turn the hexagon head screw (6.4) in the direction of the microswitch (6.1) up to the microswitch tappet.
2. Tighten the hexagon nut (6.3), so that the hexagon head screw (6.4) is placed under pre-tension by the spring washer (6.5).
3. Put a feeler gauge 0,12 mm (loose sensor plate) between the switch tappet and the hexagon head screw (6.4).
4. Connect the inspection or measurement device (diode inspection) to the NO contact black/blue.
5. Turn the hexagon head screw (6.4) in the direction of the switch (6.1) up to **signal "ON",** turn it back to the **signal "OFF"** and counter the hexagon head screw (6.4) with the hexagon nut (6.3).
6. Energise brake ➔ **Signal "ON"**
   De-energise brake ➔ **Signal "OFF"**,
   Re-adjust if necessary and repeat the inspection.
7. Remove the feeler gauge 0,12 mm.
8. Inspection with feeler gauge 0,16 mm
   Energised ➔ **Signal "ON"**
   De-energised ➔ **Signal "ON"**
9. Remove the feeler gauge 0,16 mm.
10. Repeat inspection with feeler gauge 0,12 mm
    Energised ➔ **Signal "ON"**
    De-energised ➔ **Signal "OFF"**
11. Put the feeler gauge 0,20 mm between the armature disk (2) and the coil carrier (1) in the microswitch (6.1) area and then energise the brake. **The signal must be "ON".**
12. Paint items 6.2, 6.3 and 6.4 with sealing lacquer.

Customer-side Inspection after Mounting onto the Elevator Machine

The customer-side contact is an NO contact.
Please inspect the release monitoring of both circuits:
Brake de-energised ➔ Signal "OFF",
Brake energised ➔ Signal "ON"

Table 5:
Microswitch Specifications (6.1)

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

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

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Wear Monitoring (9) Figs. 7 and 11
(Option, dependent on Type)

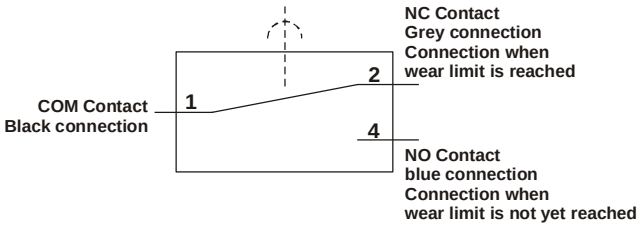
Only one microswitch for wear monitoring (9) is required per **ROBA®-duplostop®,** which is mounted onto the right brake (Figs. 7 and 11).
The **ROBA®-duplostop® brake** is delivered with manufacturer-side adjusted wear monitoring (9).

Function

Due to wear on the rotor, (3) the air gap "a" between the coil carrier (1) and the armature disk increases (2).
Once the maximum air gap (limit air gap) of 0,9 mm has been reached (Table 1), the microswitch contact (9.1) switches over and emits a signal.
The rotor (3) must be replaced.

The customer is responsible for signal evaluation.

Wiring Diagram:



Before replacing the rotor (3)

- Clean the brake and remove abraded particles using compressed air.
- Do not inhale brake dust.
- Measure the rotor thickness "new" (see Table 2).

Replacing the rotor (3)
Replace the rotor 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!

Manufacturer-side Adjustment of the Microswitch (9.1)

Danger!
The brake is screwed onto the installation device to the tightening torque (see Table 3) and the coil is de-energised.

1. Connect the inspection or measurement device (diode inspection) to the NC contact black/grey.
2. Turn the hexagon head screw (9.4) in the direction of the microswitch (9.1) until it switches, and apply pre-tension via the spring washer (9.5) using the hexagon nut (9.3).
3. Hold the hexagon nut (9.3) and turn the hexagon head screw (9.4) back until the microswitch contact (9.1) switches over again.
4. Mark the position of the hexagon head screw (9.4) (marker pen).
5. Hold the hexagon head screw (9.3) and turn the hexagon head screw (9.4) approx. 0,6 – 0,7 turns back in the direction of the microswitch (9.1).
6. Counter the hexagon head screw (9.4) with the hexagon nut (9.3) and mark the position using red securing lacquer.
7. Mount the Wear Monitoring guideline sign.

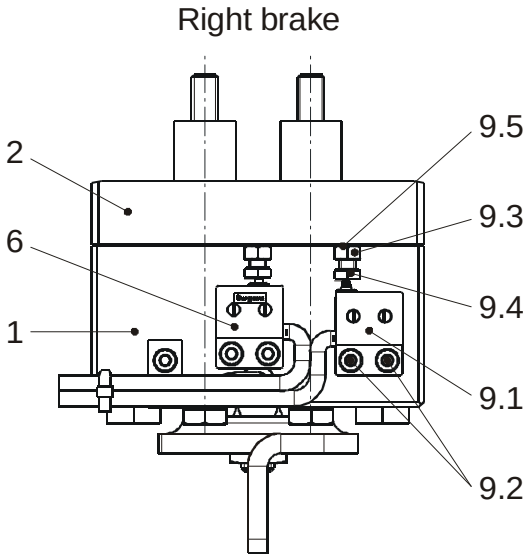


Fig. 11

Table 6:
Microswitch Specifications (9.1)

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

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

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Electrical Connection 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 (14) 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. Dependent on the brake equipment, the connection possibilities can vary. Please follow the exact connections according to the Wiring Diagram. The manufacturer and the user must observe the applicable directives and standards (e.g. DIN EN 60204-1 and DIN VDE 0580). Their observance must be guaranteed and double-checked!

Earthing Connection

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

Supply Voltage Requirements

In order to minimise noise development of the released brake, it must only be operated via DC current 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.

Device Fuses

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

Switching Behaviour

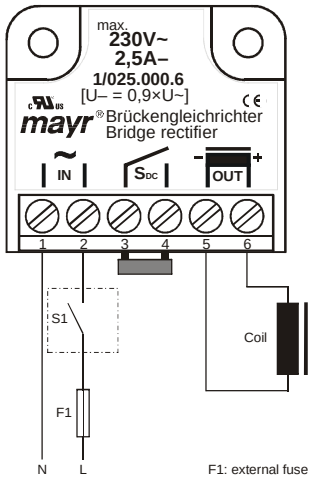
The operational behaviour of a brake is to a large extent dependent on the switching mode used. Furthermore, the switching times are influenced by the temperature and the air gap between the armature disk (2) and the coil carrier (1) (dependent on the wear condition of the linings).

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 (2) to the coil carrier (1) and releases the brake.

Magnetic Field Removal

AC-side Switching

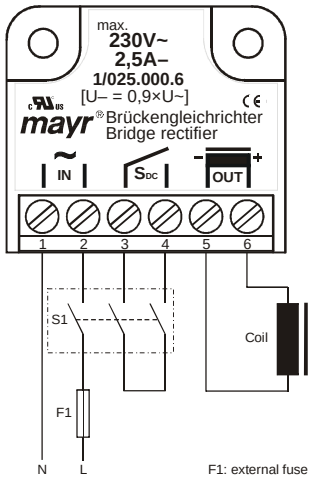


The power circuit is interrupted before the rectifier. The magnetic field slowly reduces. This delays the rise in braking torque.

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

→ **Low-noise switching;** however, the brake engagement time is longer (c. 6-10 times longer than with DC-side switching). Use for non-critical brake times.

DC-side Switching



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

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

→ **Short brake engagement times (e.g. for EMERGENCY STOP);** however, louder switching noises.

Protective Circuit

When using DC-side switching, the coil must be protected by a suitable protective 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 operation current are sufficient. Depending on the application, the switching contact can also be protected by other protective circuits (e.g. *mayr*® spark quenching unit), although this may of course then alter the switching time.

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Electrical Connection for Operation with Overexcitation

DC current is necessary for operation of the brake. The coil voltage is indicated on the Type tag (14) as well as on the brake body and is designed according to the DIN IEC 60038 (± 10 % tolerance). The brake may only be operated with overexcitation (e.g. with a ROBA®-switch fast acting rectifier or phase demodulator). Dependent on the brake equipment, the connection possibilities can vary. Please follow the exact connections according to the Wiring Diagram. The manufacturer and the user must observe the applicable directives and standards (e.g. DIN EN 60204-1 and DIN VDE 0580). Their observance must be guaranteed and double-checked!

Earthing Connection

The brake is designed for Protection Class I. This protection covers not only the basic insulation, but also the connection of all conductive parts to the PE conductor on the fixed installation. If the basic insulation fails, no contact voltage will remain. Please carry out a standardized inspection of the PE 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 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 (2) and the coil carrier (1) (dependent on the wear condition of the linings).

Magnetic Field Build-up

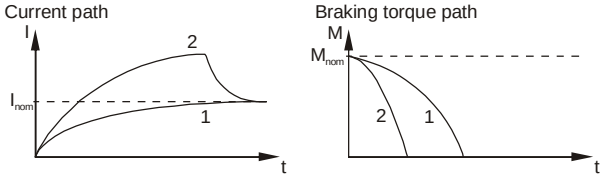
When the voltage is switched on, a magnetic field is built up in the brake coil, which attracts the armature disk (2) to the coil carrier (1) and releases the brake.

Field Build-up with Normal Excitation

If we energise the magnetic coil with nominal voltage, the coil voltage 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.

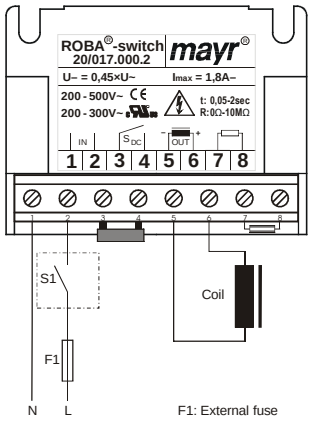
Field Build-up with Overexcitation

A quicker and safer 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 is possible to switch over to the nominal voltage (curve 2). The effective capacity may however not be larger than the nominal capacity of the coil.
The ROBA®-switch fast acting rectifier works on this principle, which is obligatory for safe operation of this brake.



Magnetic Field Removal

AC-side Switching

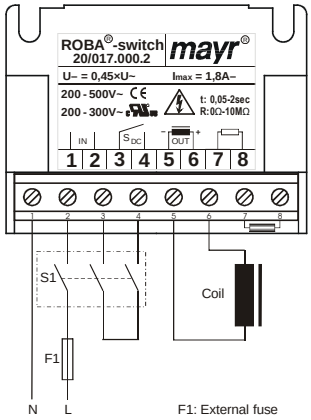


The power circuit is interrupted before the rectifier. The magnetic field slowly reduces. This delays the rise in braking torque.

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

⇒ **Low-noise switching;** however, the brake engagement time is longer (c. 6-10 times longer than with DC-side switching). Use for non-critical brake times.

DC-side Switching



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

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

⇒ **Short brake engagement times (e.g. for EMERGENCY STOP);** however, louder switching noises.

Protective Circuit

When using DC-side switching, the coil must be protected by a suitable protective 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 operation current are sufficient. Depending on the application, the switching contact can also be protected by other protective circuits (e.g. *mayr*® spark quenching unit), although this may of course then alter the switching times.

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Brake Inspection
(Customer-side after mounting Installation onto Elevator Machine)

- ❑ **Individual air gap inspection**
  (Nominal air gap "a" and air gap "b" on both brake circuits acc. Table 1 and Fig. 2).
- ❑ **Braking torque inspection:**
  Please compare the requested braking torque with the torque stated on the Type Tag.
- ❑ **Release function inspection**
  (Battery operated to guarantee emergency escape for passengers during a power failure).
- ❑ **Switching function inspection**
  Energised brake **Signal "ON" (NO contact)**
  De-energised brake **Signal "OFF" (NO contact)**

Dual Circuit Brake Functional Inspection

The **ROBA®-duplostop®** brake is equipped with a double safety (redundant) brake system.
This means that, should one circuit fail, the braking effect is 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 function is not guaranteed.
Shut down the elevator, de-install and inspect the brake.

The individual circuit inspection is carried out by energising the individual circuits with nominal voltage.

Inspection left brake circuit:
1. Energise the right brake circuit.
2. Trigger an EMERGENCY STOP with the left brake circuit and inspect the stopping distance according to the elevator regulations.
3. De-energise the right brake circuit.

Inspection right brake circuit:
1. Energise the left brake circuit.
2. Trigger an EMERGENCY STOP with the right brake circuit and inspect the stopping distance according to the elevator regulations.
3. De-energise the left brake circuit.

Inspection both circuits:
Energise both braking circuits with nominal voltage.
Trigger an EMERGENCY STOP and inspect the stopping distance according to the elevator regulations. The stopping distance must be much shorter than the stopping distance for an individual circuit.

Maintenance

ROBA®-duplostop® brakes are mainly maintenance-free.
The friction linings are robust and wear-resistant. This ensures a particularly long service lifetime.
However, the friction lining is subject to wear after frequent EMERGENCY STOP braking procedures. Generally, such procedures are registered by the elevator controls and duly stored, or request intervention by an expert. Within the scope of this intervention and/or maintenance (in particular during implementation acc. DIN EN 13015 Appendix A), the causes of the malfunction must be found, assessed and removed.
Features subject to causality such as the air gap can thereby be checked and appropriate measures can be taken.

The following checks must be carried out after each routine inspection interval:

- ❑ Braking torque or retardation inspection (individual brake circuits). (TÜV interval)
- ❑ Inspection of air gap braked (both brake circuits) (TÜV interval)
- ❑ Inspection of toothing backlash, toothed shaft on motor to the rotor (3) or hub (15) to the rotor (3)
  Max. permitted toothing backlash 0,5°. (TÜV interv al)

Danger!
To inspect the rotor (3) wear condition, please measure the air gap "a" acc. Table 1 and Fig. 2.
Once the limit air gap (0,9 mm) for the brake has been reached, meaning that the friction linings are worn down, the braking torque is lost and the rotor (3) must be replaced.
Please follow the Installation section backwards to dismantle the brake (page 11).

Disposal

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

Electronic components
(Rectifier / ROBA®-switch / Microswitch):

Products which have not been dismantled can be disposed of under the Code 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)

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)

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Malfunctions / Breakdowns:

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

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