Installation and Operational Instructions for ROBA®-diskstop®
Type 894.2_ _._ _ Size 10 (B.8.4.4.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 822**

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

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

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

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

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

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Safety Regulations

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

General Guidelines

DANGER

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

Brakes may generate further risks, among other things:


Hand injuries


Danger of seizure


Contact with hot surfaces


Magnetic fields

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

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

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

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

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

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

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

Guidelines for Electromagnetic Compatibility (EMC)

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

Application Conditions

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

- ❒ Mounting dimensions and connection dimensions must be adjusted according to the size of the brake at the place of installation.
- ❒ Use of the brake in extreme environmental conditions or outdoors, directly exposed to the weather, is not permitted.
- ❒ The brakes are designed for a relative duty cycle of 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 180 1/h.
  These values are valid for intermittent periodic duty S3 60 %.
  The permitted surface temperature on the mounting surface must not exceed 80 °C at a max. ambient temperature of 40 °C.
- ❒ The braking torque is dependent on the current bedding-in condition of the brake. Bedding in / conditioning of the friction linings is necessary.
- ❒ The brakes are only designed for dry running. The torque is lost if the friction surfaces come into contact with oil, grease, water or similar substances or any other foreign bodies.
- ❒ The surfaces of the outer components have been phosphated manufacturer-side to form a basic corrosion protection.

CAUTION

The friction linings 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 friction linings can seize up to the brake disk after longer downtimes.

CAUTION

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

Intended Use

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

Earthing Connection

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

Class of Insulation F (+155 °C)

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

Protection

(mechanical) 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
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 81-1	(End of the period of applicability: 31 AUG 2017)
EN ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction
DIN EN 61000-6-4	Interference emission
EN 12016	Interference immunity (for elevators, escalators and moving walkways)

Liability

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

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

Guarantee

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

CE Identification

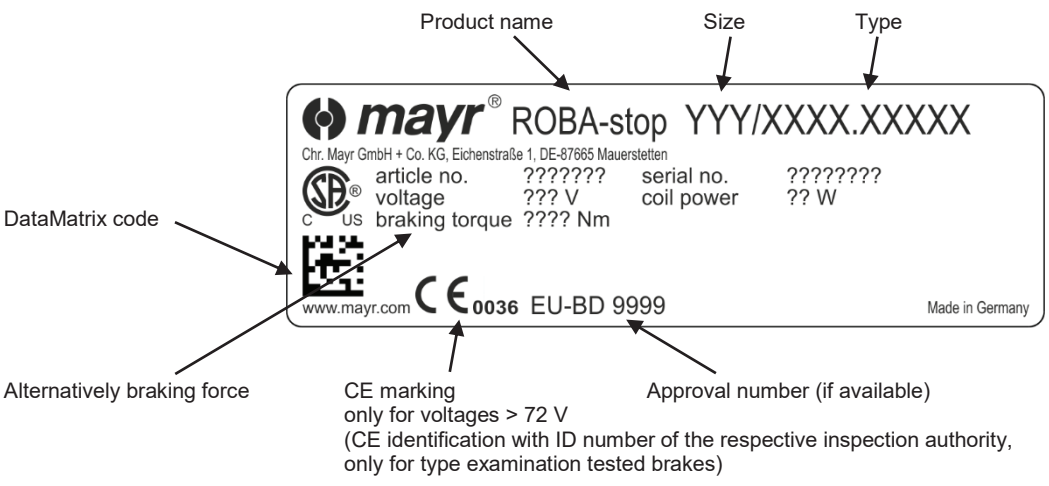
CE according to the Low Voltage Directive 2014/35/EU and the Elevator Directive 2014/33/EU

Conformity Markings

c SP us in terms of the Canadian and American approval

Identification

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



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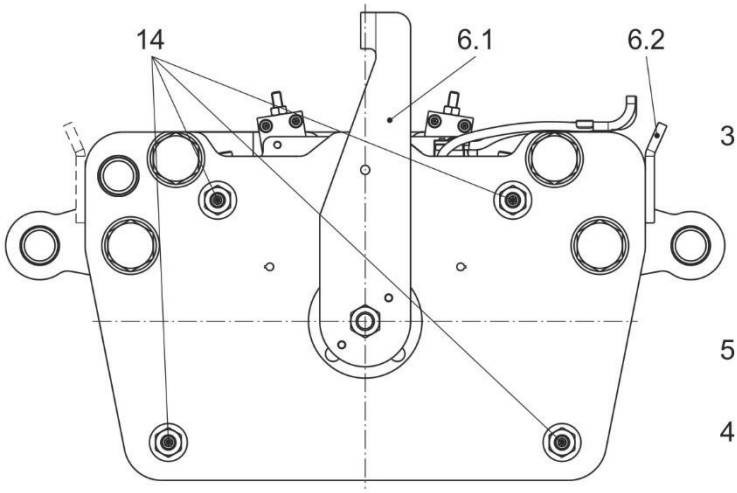

Fig. 1

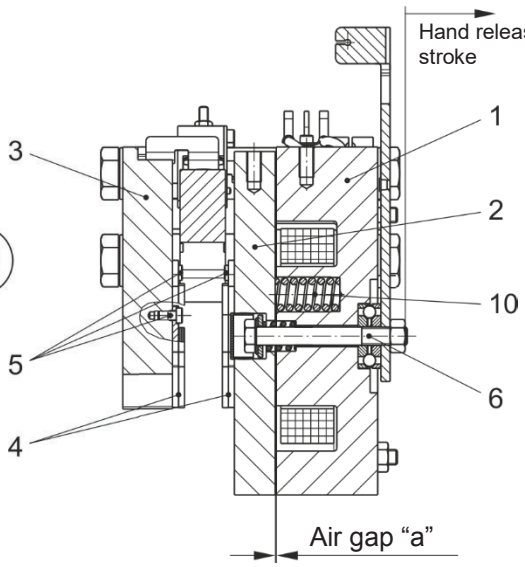

Fig. 2

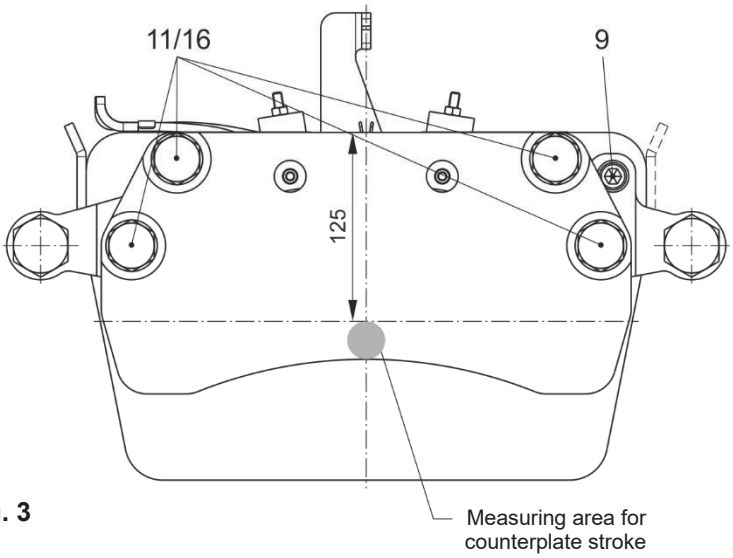

Fig. 3

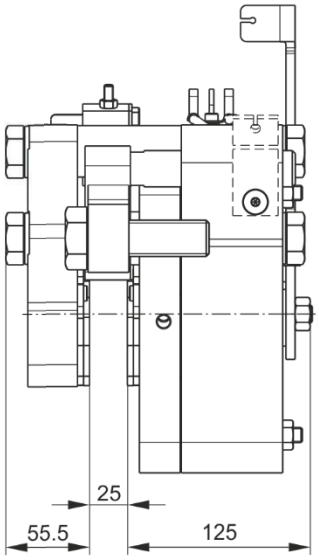

Fig. 4

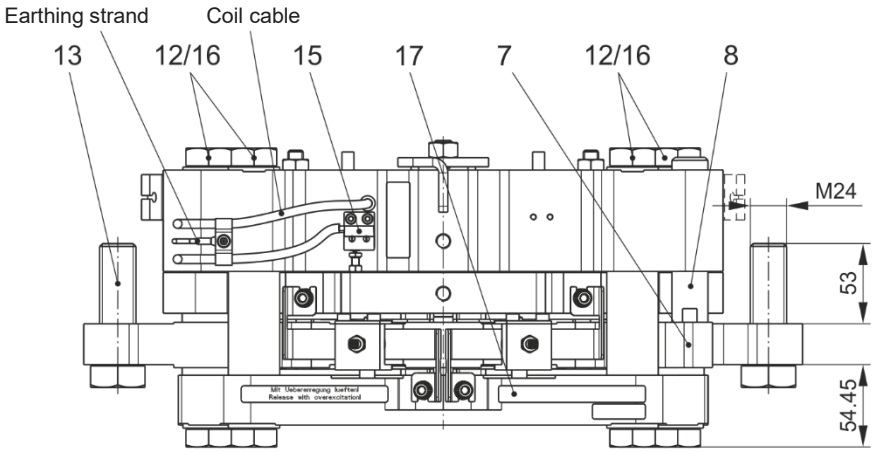

Fig. 5

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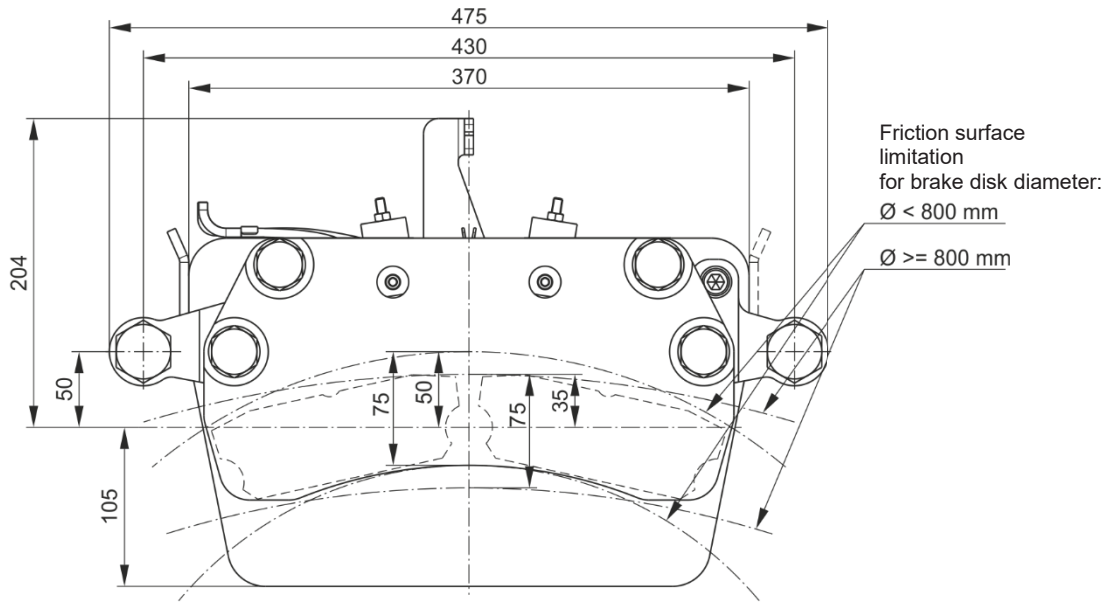

Fig. 6

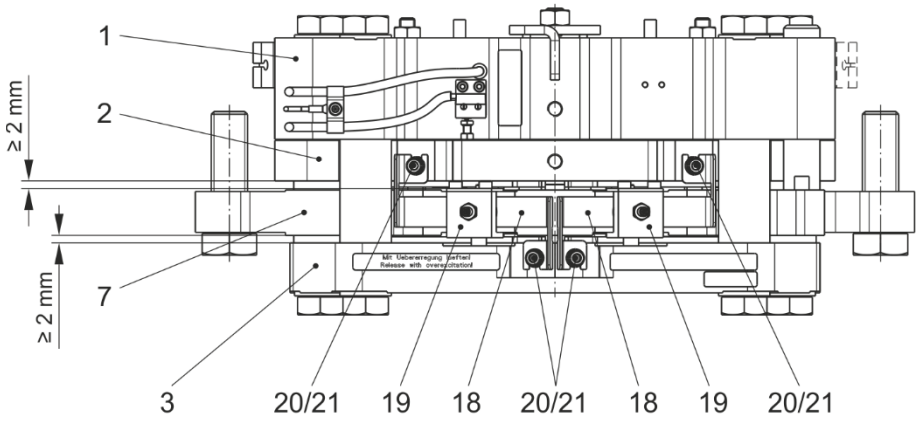

Fig. 7

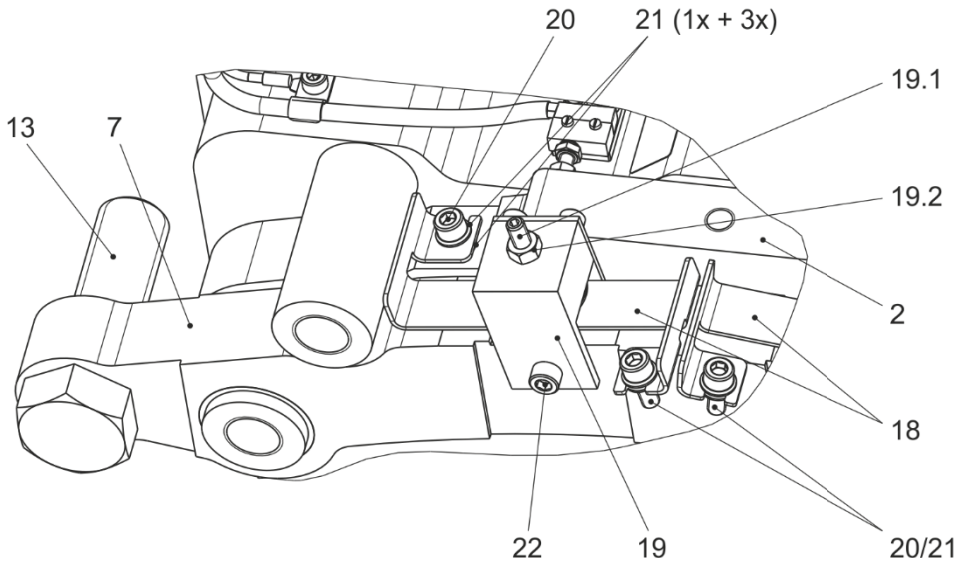

Fig. 8 (Alignment mechanism / depicted without counterplate (3))

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

Item	Name	Pcs.
1	Coil carrier assembly with coil	1
2	Armature disk	1
3	Counterplate	1
4	Friction pad assembly	4
5	Cap screw M6 x 12	24
6	Hand release assembly	1
6.1	Hand release lever	1
6.2	Lock washer	1
7	Pad	1
8	Guide bolt	1
9	Cap screw M12 x 35	1
10	Thrust spring	17
11	Hexagon head screw M20 x 65	4
12	Hexagon head screw M20 x 100	4
13	Hexagon head screw M24 x 80	2
14	Noise damping assembly	4
15	Release monitoring assembly	1
16	Washer	8
17	Type tag	1
	Parts for alignment mechanism:	
18	Lever	2
19	Thrust piece assembly	2
19.1	Set screw M6 x 25	2
19.2	Hexagon nut M6	2
20	Cap screw M6 x 16	4
21	Washer	12
22	Cap screw M6 x 35	2

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Table 1: Technical Data

Design:	performance-optimised	noise-optimised
Braking force:	11227 N	8732 N
Braking force tolerance:	0 / +60 %	0 / +60 %
Max. friction work [1] $Q_{r\ max.}$ per braking action:	400000 J	400000 J
Brake disk diameter D:	650 – 1500 mm	650 – 1500 mm
Effective friction diameter D_{eff}:	D_{eff} = D – 80 mm	D_{eff} = D – 80 mm
Max. circumferential speed:	25 m/s	25 m/s
Brake disk width (+0 / -0.15 mm):	25 – 30 mm	25 – 30 mm
Nominal voltage U_N:	see Type tag	see Type tag
Overexcitation voltage U_O:	2 x U_N	2 x U_N
Coil capacity at nominal voltage P_N:	see Type tag	see Type tag
Coil power at overexcitation P_O:	4 x P_N	4 x P_N
Overexcitation time t_O:	≥ 2 s	≥ 2 s
Max. air gap “a” (Fig. 2) after wear	1.8 mm	1.8 mm
Protection (electrical):	IP54	IP54
Protection (mechanical):	IP10	IP10
Duty cycle with 180 switchings per hour:	60 %	60 %
Electrical connection of the magnetic coil:	2 x 0.88 mm^2	2 x 0.88 mm^2
Electrical connection of the microswitch:	3 x 0.5 mm^2	3 x 0.5 mm^2
Hand release force:	approx. 400 N	approx. 400 N
Hand release stroke:	> 2.5 mm	> 2.5 mm
Tightening torque Item 5:	10 Nm	10 Nm
Tightening torque Item 9:	80 Nm	80 Nm
Tightening torque Items 11/12:	410 Nm	410 Nm
Tightening torque Item 13:	710 Nm	710 Nm
Ambient temperature:	-5 °C to +40 °C	-5 °C to +40 °C
Mass:	76 kg	76 kg

DANGER

If the brake is operated with air gap “a” > 1.8 mm, it becomes a **safety risk** as the braking effect is no longer given because the armature disk (2) lies again the hand release (6).

[1] The thermal load for a brake cannot be stated. Most of the brake energy is transferred onto the brake disk. The thermal load capability is dependent on the heat dissipation capacities of the brake disk.

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Table 2: Switching Times [ms]

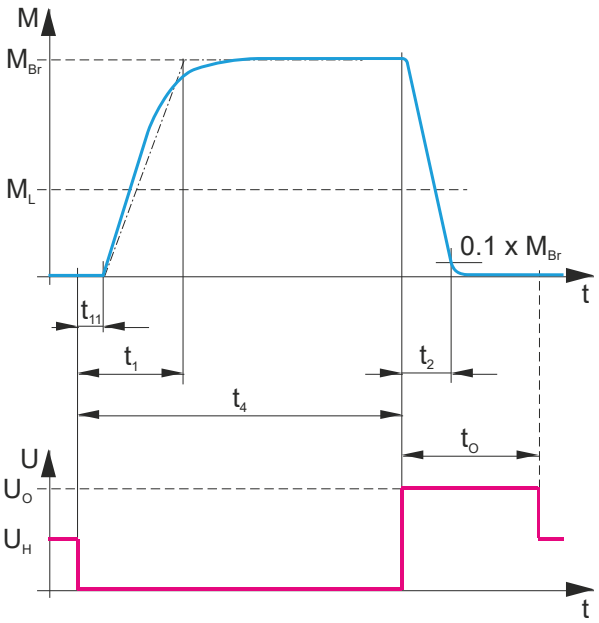
Design	Attraction t_2	Drop-out t_0 DC	Drop-out t_{50} [2] DC	Drop-out t_{90} [3] DC	Drop-out t_{11} AC	Drop-out t_1 AC
performance-optimised	450	60	110	220	500	900
noise-optimised	400	85	155	270	500	1200

[2] Referring to the effective braking torque

[3] Referring to the nominal 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.
The use of varistors for spark quenching increases the DC-side switching times.

Diagram 2: Torque-Time Diagram



Key

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

The switching times are dependent on the respective spring pressure.

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Application

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

Design

The ROBA®-diskstop® is a spring applied, electromagnetically releasing safety brake - a component in terms of DIN VDE 0580. It is designed for installation into gearless elevator machinery for use as a holding brake with occasional EMERGENCY STOP braking actions.
On dimensioning, the braking torque, the speed as well as the permitted friction work in case of EMERGENCY STOP need to be taken into consideration for safe holding of the load torque and safe compliance with the required braking distance.
Furthermore, the ROBA®-diskstop® 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.
For a dual-circuit brake system, at least two brakes are necessary.
Please also observe the Annex in the EU Type Examination Certificate.
In order to guarantee the maximum braking distance while both brakes act, an inspection of the protection device including all control and brake times (detector / control / brake) is necessary.
The respective standards, regulations and directives must be observed.

Function

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

Spring applied function:
In de-energised condition, thrust springs (10) press the armature disk (2) against the brake disk.
The brake disk is held between the friction pads (4).

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

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

Scope of Delivery / State of Delivery

The brakes are manufacturer-assembled ready for installation.
The release monitoring (15) device is set manufacturer-side.
Included loose in delivery are: the hexagon head screws (13).
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.

Brake Temperature

DANGER

At an ambient temperature of +40 °C and a duty cycle of 60 %, the brake can heat up to +65 °C.
Do not touch the brake
=> Danger of burns!

Installation Conditions

Before mounting the brake, please observe:

- Axial run-out deviation of the brake disk: max. 0.2 mm

Due to axial run-out deviations or tilting between the brake and the brake disk, the brake disk may rub against the friction linings.

- Brake disk surface quality (friction surfaces): Ra = 3.2 µm
- Brake disk material: steel or cast iron.
- Brake disk width (25 – 30 mm) acc. respective Drawing with tolerance +0 / -0.15 mm.
- There must be a gap of at least 2 mm between the pad (7) and the counterplate (3) as well as between the pad (7) and the armature disk (2).
- Brake disk deformation or bearing backlash must not influence the set air gap.
- The screw-on surfaces in the ∅ 50 mm range must be 0.1 mm parallel to the brake disk.
- Keep the brake surfaces and the friction linings grease-free.
- Positional tolerance for installation threaded holes: ∅ 0.5 mm.
- Please ensure a suitable protective cover on the open brake.
- The screw connection must transmit the occurring transverse forces safely.
- The tensile strength R_m of the attachment wall must be at least 300 N/mm².
- The screw-in depth of both fixing screws (13) must be at least 25 mm.

Adjustment

The brakes are equipped manufacturer-side with the respective springs for the braking force stated on the Type tag. 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 microswitch is also set manufacturer-side. Despite great care during the manufacturer-side adjustment, re-adjustment might be necessary after installation due to transportation and handling. Furthermore, such switches cannot be considered fail-safe.
Please also observe the section ‘Release Monitoring’.

Noise Damping (Item 14 / Fig. 1):

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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Brake Installation (Figs. 1 – 8)

The brake is pre-assembled manufacturer-side.

1. Release the brake mechanically using a suitable auxiliary device.
2. Push the released brake over the brake disk and position it so that both hexagon head screws (13) can be screwed in. **Screw tightening torque 710 Nm**.

> While pushing the brake over the brake disk, please make sure that the friction linings are not damaged.

3. Remove the auxiliary device for releasing the brake.
4. Loosen the fixing screw (cap screw 9) on the guide bolt (8).
5. Switch the brake 3-4 times so that it aligns with the brake disk.
6. De-energise the brake.
7. Carefully tighten the cap screw (9) once more. During tightening, pull the cap screw (9) and the guide bolt (8) upwards lightly.
   Screw tightening torque 80 Nm.
8. **Check that the brake moves axially on the pad (7). It must be possible to move the opened brake by hand in the guide. On an engaged brake, there must be a gap of at least 2 mm between the pad (7) and the counterplate (3) as well as between the thrust piece (19) and the armature disk (2), see Fig. 7.**
9. **Check the air gaps "a" (Fig. 2) between the coil carrier (1) and the armature disk (2).**
   In new condition, the air gap "a" must be max. 1 mm on a de-energised brake. Measurements on both sides at friction pad (4) level – calculate the average.
10. Align the lever (18) for the alignment mechanism parallel to the armature disk (2) and as centrally as possible on the pad (7).
11. Pre-tension the thrust pieces of the alignment mechanism. Loosen the counter nut (19.2), screw the set screw (19.1) in up to contact (cup spring package on block) and then unscrew it by 0.5 turns. While doing this, please make sure that the spring joints of the lever (18) are not bent too much. Re-tighten the counter nut (19.2) again in this position (tightening torque 9 Nm), see Fig. 8.
12. Tighten the cap screws (20) with 10 Nm.
13. If possible, check using a feeler gauge whether all friction linings lift completely from the brake disk.
    Alternative: Check the stroke of the counterplate (3) at the marked position (Fig. 3), using a dial gauge, by switching the brake. The counterplate (3) must lift from the brake disk in the area 0.10 – 0.35 mm.
    At stroke > 0.35 mm: Check using a feeler gauge whether the armature disk-side friction linings lift completely from the brake disk. If this is the case, the setting is OK. If this is not the case, please loosen the cap screw (9), pull the guide bolt (8) up even more and tighten the cap screw (9) again with a **tightening torque of 80 Nm**.
    At stroke < 0.10 mm: Loosen the cap screw (9), position the guide bolt (8) lower and tighten the cap screw (9) again using a **tightening torque of 80 Nm**.
14. Turn the brake disk, making sure that the brake disk does not rub.
15. De-energise the brake.

Special case:
Brake is mounted at the side, pad (7) is vertical

1. Brake is screwed onto motor.
2. Loosen the cap screw (9).
3. Release the brake electrically and lift at the coil carrier (1).
4. Insert a feeler gauge t ~ 0.4 mm between the friction lining and the brake disk, at the top on the counterplate (3) side.
5. De-energise the brake.
6. Carefully tighten the cap screw (9) once more. During tightening, pull the cap screw (9) and the guide bolt (8) upwards lightly.
   Screw tightening torque 80 Nm.
7. Energise the brake.
8. Remove the feeler gauges.
9. For further procedures, please see points 8 – 15, left column.

Installation of Bowden Cable Hand Release

The hand release is pre-assembled manufacturer-side.

In order to install the Bowden cable, the lock washer (6.2) must be mounted on the correct side. If this is not the case, the lock washer (6.2) must be screwed off and screwed onto the opposite side.
The hand release lever (6.1) can be pivoted by approx. 30°. Adjust the Bowden cable so that the hand release can pivot back to the middle position (after actuation)
=> Functional inspection.

Brake Inspection (before brake initial operation)

➔ **Visual inspection:**
for proper condition of the brake (rust etc.) and no grinding.

➔ **Carry out a release inspection:**
by energising the brake or manually by actuating the hand release.

➔ **Switch functions inspection of the release monitoring / for connection as NC contact:**

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

for connection as NO contact:

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

The braking torque is not achieved until after the run-in procedure has been carried out.
The run-in conditions must be aligned with the manufacturer.

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. The braking torque is dependent on the respective run-in condition of the friction surfaces.
We recommend allowing the friction surfaces to run in when installed and under permitted loads.
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). Furthermore, friction materials (synthetic resin bonded rubber mixtures) 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.

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Electrical Connection and Wiring

The brakes must only be operated 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!

Earthing Connection

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

Device Fuses

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

Switching Behaviour

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

Magnetic Field Build-up

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

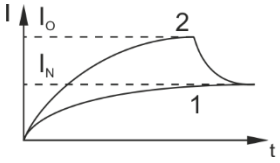
Field Build-up with Normal Excitation

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

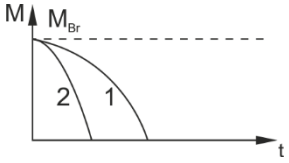
Field Build-up with Overexcitation

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

Current path

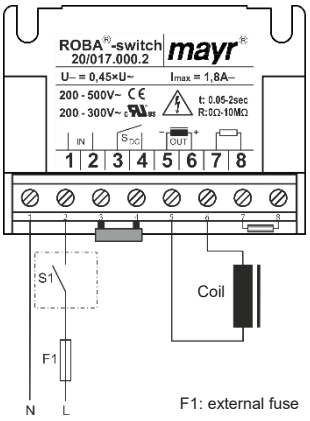


Braking torque path



Magnetic Field Removal

AC-side switching



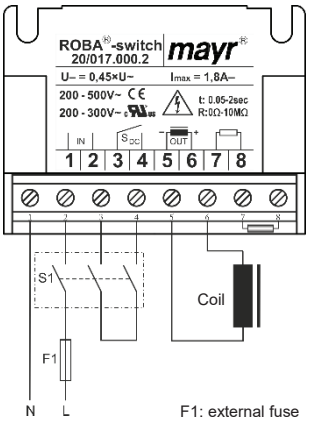
F1: external fuse

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 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 can lead to wear on the contacts from sparks and to destruction of the insulation.

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

Protection circuit

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

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Release Monitoring (Item 15 / Fig. 5 / Optional)

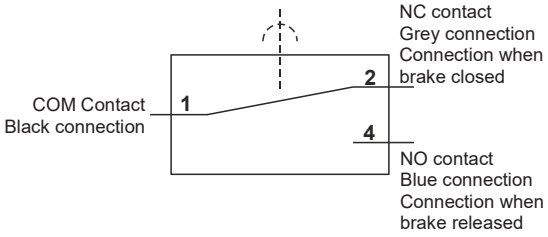
Please carry out a functional inspection before brake initial operation!

The ROBA®-diskstop® brakes are supplied optionally with manufacturer-side installed and adjusted release monitoring device.
A microswitch emits a signal for every brake condition change: “brake opened” or "brake closed“.

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

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

Microswitch Wiring Diagram:



Function

When the magnetic coil is energised in the coil carrier (1), the armature disk (2) is attracted to the coil carrier (1), the microswitch emits a signal, the brake is released.

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)

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!

Maintenance

The ROBA®-diskstop® is 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 linings are subject to functional wear. Therefore, please carry out regular friction lining inspections.

The friction pads (4) must be replaced when air gap “a” > 1.8 mm (Fig. 2) is reached between the coil carrier (1) and the armature disk (2) on a warm brake.

Replacement of the friction pads (4) and all other maintenance work must be carried out at the place of manufacture.

Guidelines on Brake De-installation

Before carrying out brake de-installation (e.g. brake change), all cap screws (20) as well as the set screw (19.1) with the counter nut (19.2) must be loosened.

Information on the Components

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

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

Classification: Hazardous property
Attention: H-classification: H372

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

Additional information:
This friction lining is not a dangerous product in terms of the EC Directive

Cleaning the Brake

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

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

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Disposal

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

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

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

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

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

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

Malfunctions / Breakdowns:

Malfunction	Possible Causes	Solutions
Brake does not release	❑ Incorrect voltage on rectifier ❑ Rectifier failure ❑ Air gap too large (worn friction lining) ❑ Coil interrupted ❑ Incorrect rectifier (e.g. normal rectifier without overexcitation)	❑ Apply correct voltage ❑ Replace rectifier ❑ Replace the friction pads ❑ Replace brake ❑ Use the correct, appropriate rectifier

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

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