

GEARLESS Z6 - Z20




A.C. drive for lift

Installation and maintenance manual

GEARLESS Z6 - Z20

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IMPORTANT

These symbols , ,  appear in this document whenever it is important to take special precautions during installation, operation, maintenance or servicing of the motors.

It is essential that electric motors are installed by experienced, qualified and authorized personnel.

In accordance with the main requirements of EEC Directives, the safety of people, animals and property should be ensured when fitting the motors into machines.

Particular attention must be given to equipotential ground or earthing connections.

The following preliminary precautions must be taken before working on any stationary device:

- Mains voltage disconnected and no residual voltage present
- Careful examination of the causes of the stoppage (blocked transmission - loss of phase - cut-out due to thermal protection - lack of lubrication, etc)



Even when not supplied with power, there is voltage at the terminals of a rotating synchronous motor with magnets.

Accordingly, before carrying out any work check carefully that the motor is not rotating.



For dismantling a Z range motor only

Assembly or maintenance of the rotor must not be carried out by people with pacemakers or any other implanted medical electronic device.

The motor rotor contains a powerful magnetic field. When the rotor is separated from the motor, its field may affect pacemakers or disturb digital devices such as watches, mobile phones, etc.

GEARLESS Z6 - Z20

A.C. drive for lift

Dear Customer,

You have just acquired a LEROY-SOMER motor.

This motor benefits from the experience of one of the largest manufacturers in the world, using state-of-the-art technology in automation, specially selected materials and rigorous quality control. As a result, the regulatory authorities have awarded our motor factories **ISO 9001 - Edition 2000 international certification from the DNV**. Similarly, our environmental approach has enabled us to obtain **ISO 14001: 2004**.


Products for particular applications or those designed to operate in specific environments are also approved or certified by the following organisations: CETIM, LCIE, DNV, ISSEP, INERIS, CTICM, UL, BSRIA, TUV, CCC and GOST, which check their technical performance against the various standards or recommendations.


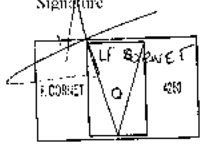
We thank you for making this choice, and would ask you to read the contents of this manual.

By observing a few essential rules, you will ensure problem-free operation for many years.

LEROY-SOMER MOTORS

CE conformity

Our motors conform to standard EN 60034 (IEC 34), and therefore to the Low Voltage Directive 73/23/EEC modified by Directive 93/68, which is demonstrated by their marking with the symbol .

MOTORS LEROY-SOMER SAISON 3ème CS 4005 1635 ANGOULÊME CEDEX 9 FRANCE	
DECLARATION OF CONFIRMITY AND INCORPORATION	
LEROY-SOMER MOTORS declares that the following products : Electrical AC MOTORS : Z2-Z3-Z4-Z6-Z10-Z12-Z20	
Conform to the harmonised standard EN 60 034 (IEC 34) and thus meet the essential requirements of Low Voltage Directive 2006/95/CE :	
Conform to the standard EN 81.1-1998 and thus meet the essential requirements of Directive 2006/42/CE :	
By reason of such conformity, these product ranges may be used in machines governed by the Machinery Directive 2006/42/CE, provided that the method of integration or incorporation and / or assembly conforms to at least the regulations in standard EN 60204 « Electrical Equipment for Machinery »	
The products defined above must not be installed unless the machine in which they are incorporated has been declared as conforming to the relevant Directives.	
The products, as components, are bound by the essential requirements of 2006/42/CE which are anticipated for the equipment manufactured by our customer:	
Note : when motors are powered by specially adapted electronic converters and / or servo-controlled by electronic control-monitoring devices, they must be installed by a professional person. This person must take responsibility for complying with the regulations concerning electromagnetic compatibility in the country where the product is used.	
Fabrice CORNET Quality manager	Drawn up at Angoulême On 10 th December 2014 Signature 

NOTE:

LEROY-SOMER reserves the right to modify the characteristics of its products at any time in order to incorporate the latest technological developments. The information contained in this document may therefore be changed without notice.

Copyright 2003: LEROY-SOMER MOTORS

This document is the property of LEROY-SOMER.

It may not be reproduced in any form without prior authorization.

All brands and models have been registered and patents applied for.


GEARLESS Z6 - Z20**A.C. drive for lift**

1 - RECEIPT	5
2 - STORAGE	5
2.1 -Storage location	5
2.2 -Prolonged storage (> 3 months)	6
3 - ENVIRONMENT	6
4 - COMMISSIONING	6
4.1 -Mechanical installation	6
4.1.1 -Cleaning	6
4.1.2 -Mechanical installation	7
4.1.3 -Terminal boxes	8
4.2 -Wiring	9
4.3 -Installing the ropes	9
4.4 -Commissioning	10
5 - MAINTENANCE/SERVICING	10
5.1 -After one month's operation	10
5.2 -Every year	10
5.3 -Every 3 years	10
6 - CHECK OF THE AIR GAP	10
7 - ADJUSTMENT OF THE MICRO SWITCH	11
8 - REPLACING THE ENCODER	12
8.1 - Dismantling the encoder	12
8.2 - Reassembling the encoder	12
9 - ORDERING SPARE PARTS	12
APPENDIX 1 - ELECTRICALLY RELEASED BRAKE	15

GEARLESS Z6 - Z20

A.C. drive for lift

To ensure that the LEROY-SOMER Gearless Z motor you have just purchased is entirely satisfactory, it is essential to adhere to the following instructions.

 **Contact with energized or rotating parts may cause injury. Do not touch the housing of a motor that is in operation, as it can reach high temperatures.**

Moving motor parts are painted yellow, except for the sheave grooves and brake discs.

REMINDER: Installation, servicing and maintenance must only be carried out by qualified personnel.

Failure to follow the instructions in this document, or to apply them correctly, releases the manufacturer from liability.

The product is covered by the warranty during the guarantee period as long as any partial or total dismantling has only been performed with the assistance of LEROY-SOMER (or its approval).

 **Check that the lift car has been immobilised before performing any work on the motor or the brakes.**

1 - RECEIPT

Checks:

- As soon as you receive the machine, check that the nameplate on the machine conforms to your order.

- Inspect the machine as soon as it is received. If there is any damage that has been caused by transportation, contact the carrier in the usual way.





2 - STORAGE

2.1 - Storage location

This location must be dry and protected from harsh weather conditions, cold (temperature above -15°C), frequent temperature variations (to prevent the risk of condensation), and free from vibration, dust and corrosive gases.

If there is any vibration in the storage area, it is advisable to rotate the sheave at least twice a month. (Supply power to the brakes in order to be able to turn the sheave).

In certain transport conditions the grooves of the sheave are protected by a special varnish. This varnish must not be removed during storage.

Model		Serial number	
AC GEARLESS			
Type:	Z6	Serial N°:	000000 / 001
Max sheave load:	6000 kg	Weight:	783 kg
Amb Temp: 40°C		MOTOR	
Nom voltage:	340 V	Current:	62 A
Frequency:	57,6 Hz	Duty cycle:	S5 60%
Speed:	216 Rpm	Starts / hour:	10
		Elec insulation: H	
		Phases: 3	
		Nom power: 27,5 kW	
		Protection : IP20	
BRAKE			
Pick up voltage:	3x95 VDC	Current:	1,58 A
Holding voltage:	3x45 VDC	Current:	0,73 A
		Brake Torque: 3300 Nm	
  			
 16015 ANGOULEME Cedex FRANCE MADE IN FRANCE			

GEARLESS Z6 - Z20

A.C. drive for lift

2.2 - Prolonged storage (> 3 months)

Place the machine in a sealed waterproof enclosure with a dehydrating sachet inside corresponding to the volume to be protected and the degree of humidity of the location.

Greasing

- Bearings which cannot be regreased

Maximum storage: 3 years. After this time, replace the bearings.

- Regreaseable bearings

Storage period	Less than 6 months	The motor can be commissioned without regreasing
	More than 6 months Less than 1 year	Regrease before commissioning, as described in section 5.3
	More than 1 year Less than 5 years	Replace the grease completely

3 - ENVIRONMENT

The rated characteristics are given for operation in a standard environment

(see IEC 60034-5):

- Altitude less than 1000 m
- Maximum humidity: 95%
- Temperature between 0 and 40°C

Derating may be provided if special conditions are indicated at the time the equipment is ordered.

4 - COMMISSIONING

BEFORE INSTALLATION

If the equipment has been stored for several months, it is essential to check the correct insulation between the phases and the earth terminal on the motor (minimum 100 MΩ at 500 V D.C. for 60 seconds) after having disconnected all the electronic circuits if necessary.



Do not apply the megohmmeter to the heat sensor terminals as this may damage them.

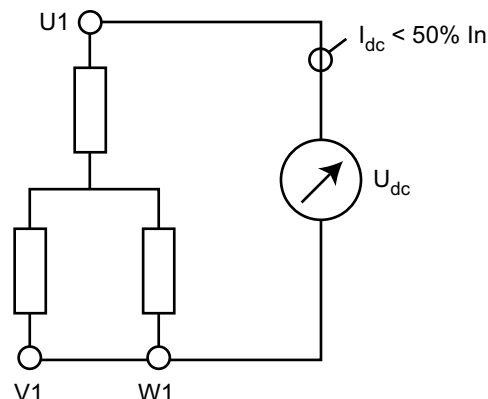
If the required value is not reached, dry the motor using internal or external heating.

Drying using external heating

- Place the motor in an oven at 70°C for at least 24 hours until the correct insulation is obtained (100 MΩ).
- Take care to increase the temperature gradually to clear the condensation.
- After drying at ambient temperature during the cooling phase, check the insulation value regularly, as it will initially tend to fall then rise.

Drying using internal heating (Fig 2)

Winding connections for drying using internal reheating



- Connect motor windings V1 and W1 in parallel in relation to U1.
- Read off the resistance between U and V/W.
- Apply a low voltage D.C. current to them (to obtain 10% of the rated current calculated using the winding resistances), then increase the voltage until 50% of the rated current is reached.
- Maintain the power for 4 hours. The temperature of the motor should increase slightly.



If the brakes are released, the sheave will move slightly on power-up (angular setting of the rotor in relation to the stator).

4.1 - Mechanical installation

The installation must comply with the motor characteristics indicated on the nameplate (see section 1).

It must include electrical safety devices.

Check that the handling equipment (slings, etc.) is suitable for the weight of the machine.

Use the attachment points provided on the machine.

Check that the ropes are correctly positioned so that they are not damaged.

Provide the necessary mechanical protection devices to prevent people working on the machine becoming caught or trapped by the sheave and/or the ropes.

The motors must be installed in such a way that the cooling air (not too damp, dust-free, and containing no vapour or corrosive gases) circulates freely.

4.1.1 - Cleaning

- Release the brake using the manual release system.
- Remove the protective varnish from the sheave grooves (if it has been applied).



Do not use abrasive equipment. Use only a cloth soaked in alcohol. Care must be taken not to get any alcohol or grease on the brake disc.

WARNING: Use the alcohol in a well ventilated area.

GEARLESS Z6 - Z20

A.C. drive for lift

4.1.2 - Mechanical installation

The GEARLESS machine must be installed on a rigid chassis and must be secured using 8 bolts and washers, tightened to the torque indicated in the table opposite. The overall chassis mating surface flatness error must be < 0.3 mm.

The bolts must only be tightened when the ropes, car, counterweights and sheave are perfectly aligned.

Before installing the ropes, check that the sheave can be rotated freely by hand when the brakes are released.

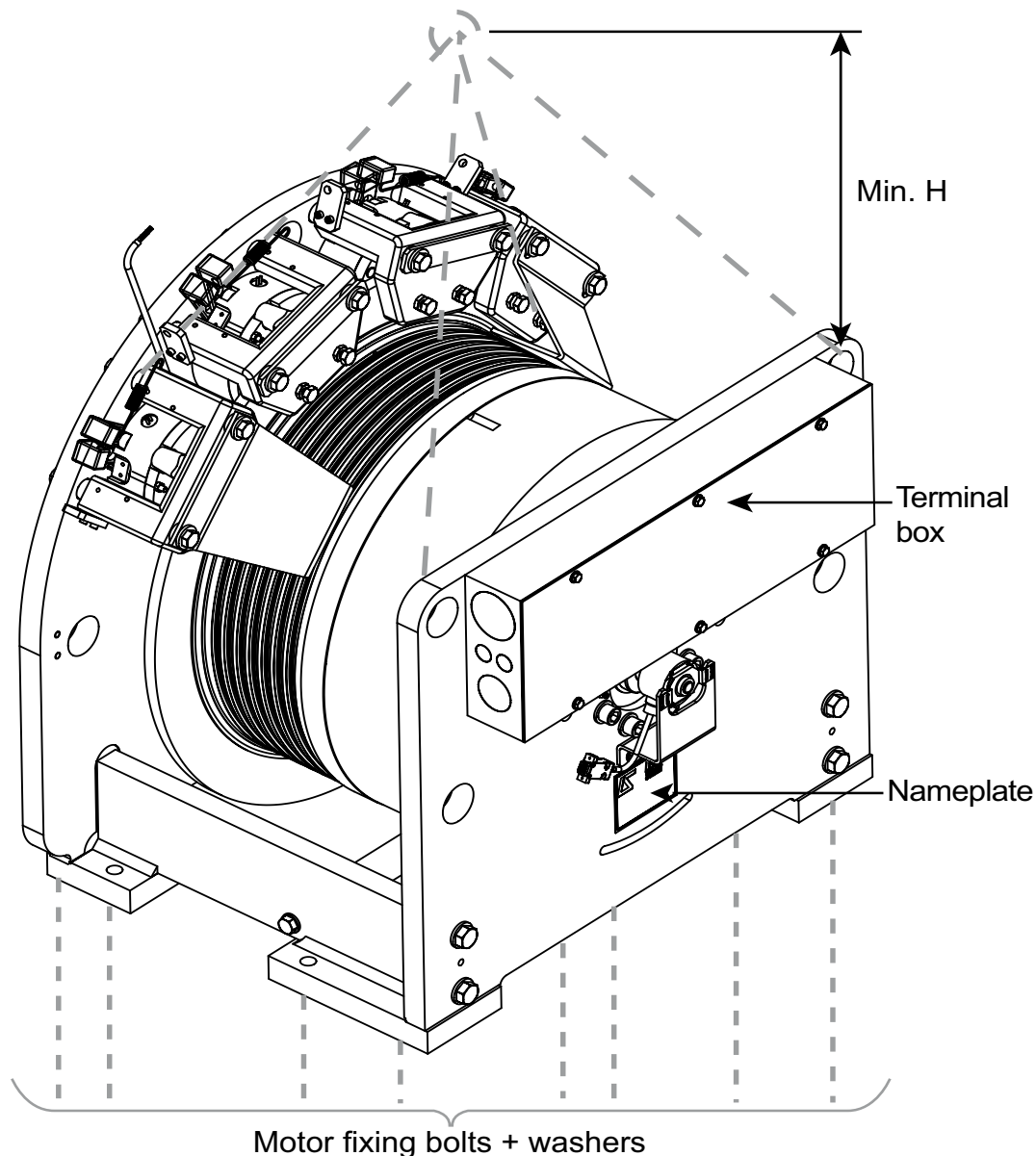
Check that the ropes are of the correct type for the sheave.

When the ropes have been installed, refit then tighten the guards.

⚠ There is a high risk of jamming your fingers between the ropes and the sheave.

Motor type	Lifting		Fixing	
	Weight (kg)	Min. H (m)	Bolt fixing	Tightening torque (Nm)
Z6 MR	900	1.0		
Z6 MRL	900	1.0		
Z10	1000	1.5		
Z12	1200	1.5		
Z20	2500	1.5	Ø28 cl 8.8 (M24/1»)	652 ±32

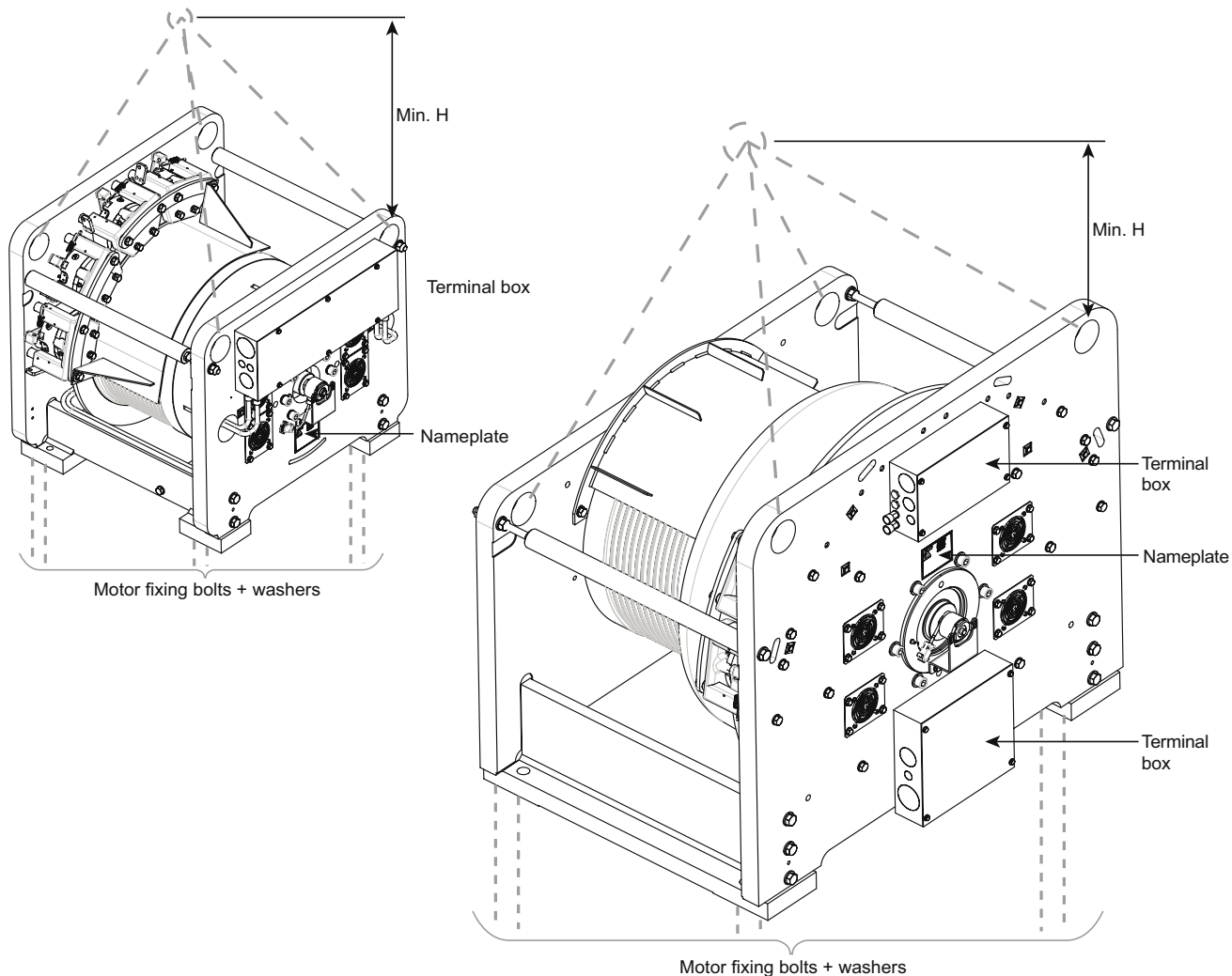
4.1.2.1 - Installation of Gearless Z6



GEARLESS Z6 - Z20

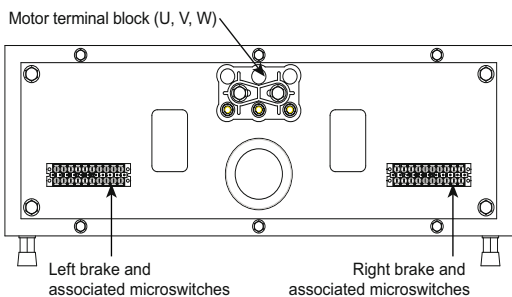
A.C. drive for lift

4.1.2.2 - Installation of Gearless Z6 MRL/Z10/Z12 and Z20

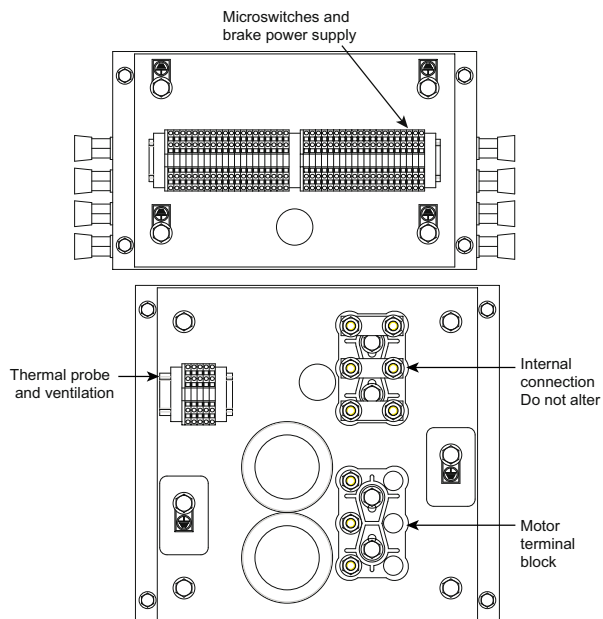


4.1.3 - Terminal boxes

Terminal box for Gearless Z6/Z10/Z12



Terminal box for Gearless Z20



GEARLESS Z6 - Z20

A.C. drive for lift

4.2 - Wiring

Wiring the motor and the thermal probe

The cables shielding must be connected to earth. The cables exit by means of cables glands.

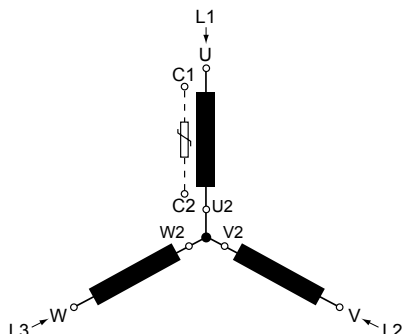


Fig. 5: Internal connections of the motor and the thermal probe

Connect the motor using cables of the correct cross-section (the cables and connectors must be sized according to the current: see the table below).

Nominal current (A) per phase	9.5	12	16	25	34	40	46	60	70	96
Min cable section (mm ²)	1.5	1.5	2.5	4	6	10	10	16	16	25



It is the responsibility of the user to connect the motor in accordance with the current legislation and regulations in the country of use. This is particularly important as regards the size of the cables, the type and size of fuses, the earth or ground connection, powering down, acknowledging insulation faults and protection against overcurrents.

This table is given for information only, and must under no circumstances be used in place of the current standards. The recommended cross-sections are given for a single-wire cables, with a maximum length of 10 m. Above this, line drops due to the cables length must be taken into account.

Particular care must be taken to tighten the nuts on the terminals. (Incorrect tightening may lead to the connections being damaged by overheating: see diagram Fig. 6).

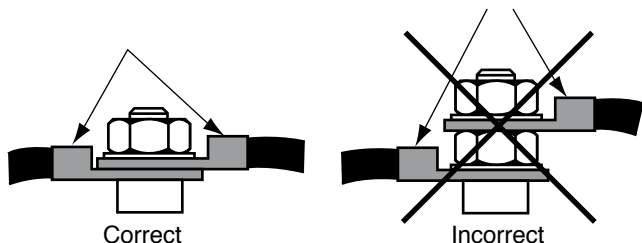


Fig. 6: Connecting the power cables

- Connect the power cables to terminals U, V and W, in accordance with IEC 600034-1 (U1, V1 and W1 for Z20).
- Connect the thermal probe to the inverter.
- Connect the motor ground to earth.

Wiring the brakes and microswitches

Connect the brakes to suit the supply.
Connect the microswitches to suit the monitoring.

If using an optional CDF power supply, please refer to the card manual.

The brake microswitches must be «NC» type, see appendix.

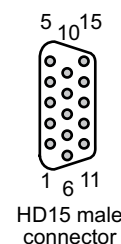
Encoder wiring

Identify the encoder by means of the reference indicated on the encoder label (Fig. 7).

Connect the encoder to the inverter with the HD15 socket.

ECN 413 encoder: SinCos encoder with EndAt link

HD15	ECN 413
1	Cos
2	CosRef
3	Sin
4	SinRef
5	Data
6	Data\
7	-
8	-
9	-
10	-
11	Clock _{out}
12	Clock _{out} \
13	+5V
14	0V
15	-



Wiring the forced ventilations

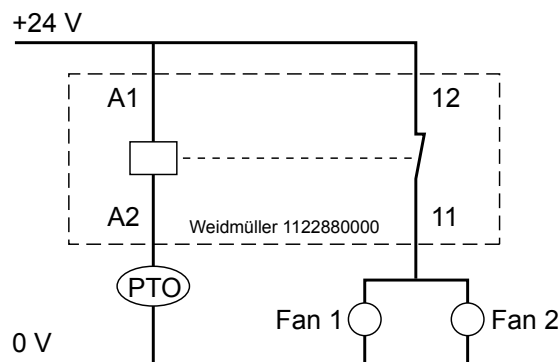
Refer to the indication fitted in the terminal box.
Characteristics of each of the forced ventilations:

- Voltage : 24VDC
- Power : 2,5W
- Flow : 54m³/h

The forced ventilations should not be supplied permanently. The motor is equipped with an additional thermal sensor (PTO) that must be used for the control of the forced ventilations.

Below is a proposal of connection for a motor equipped with 2 forced ventilations.

Before to do the final connection, supply the forced ventilations and check that the air-flow is going from the outside to the inside of the motor.



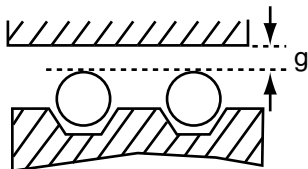
The brand and reference of the relay module is given for information only

GEARLESS Z6 - Z20

A.C. drive for lift

4.3 - Installing the ropes

- Remove the ropes guards.
- Install the ropes.
- Refit the ropes guards leaving a gap g of between 2 and 4 mm.



Important: When lubricating the ropes, avoid contaminating the friction surfaces of the brake disc. Use alcohol to clean any traces of grease from the disc.

4.4 - Commissioning

Check that the electrical equipment is correctly earthed before starting work.

Before commissioning the machine, check that all the fixings and electrical connections are correctly tightened.

After commissioning, check for:

- Noise
- Vibration
- Operation of the buttons/switches
- Also check the current and voltage on the machine while it is operating with the rated load

5 - MAINTENANCE / SERVICING



The Mayr ROBA-diskstop brakes maintenance manual included in Appendix 1 of this document states that the brakes are mainly maintenance free. Nevertheless, this is possible to adjust the micro-switches. These adjustments should remain exceptional and must be carried out only after the brakes air gap has been checked. The adjustments must only be done by skilled workers.



The maximal authorized air gap is indicated in the brakes manual in Appendix 1.



We recommend to check the brakes air gap at each maintenance inspection, or regularly enough to make sure that the potential brakes wear cannot lead to a safety risk for the users.

5.1 - After one month's operation

- Check that the screws and electrical connections are correctly tightened.
- Check the vibration. Check that there is no abnormal noise.
- Check the brakes air gap _ please see the comments at the beginning of this chapter.

5.2 - Every year

- Check that the screws and electrical connections are correctly tightened.
- Check the vibration. Check that there is no abnormal noise.

5.3 - Every 3 years

For motor end shields fitted with grease nipples, lubricate the bearings with the grease shown on the lubrication nameplate:

Motor Bearings		
2103156.B	DE	NDE
TYPE :	BS2-2213-2CS	BS2-2224-2CS
Grease :	LGEP2 (SKF)	
	20 g	60 g
Regreasing interval	3 years	

Bearings which cannot be regreased are marked « X » in the table below.

Motor type	NDE		DE (sheave)	
	Bearing	Qty (g)*	Bearing	Qty (g)*
Z6	BS2-2213-2CS	25	BS2-2213-2CS	25
Z10	BS2-2213-2CS	25	23120-2CS2	40
Z12	BS2-2213-2CS	35	BS2-2218-2CS	45
Z20	BS2-2218-2CS	50	BS2-2224-2CS	100

X: Bearings which cannot be regreased

* : On the first regreasing, increase these quantities by 15 g
See the position of the grease nipples in section 4.2.1.

6 - CHECK OF THE AIR GAP

Please see comments at the beginning of chapter 5.

Please refer to the drawing in chapter 7.

- Put the feeler gauge between brake armature disk (2) and the coil carrier (1) which is also called airgap "a" area – the feeler gauge should be inserted at 120° direction and one of them should be inserted in the area close to micro switch



The maximal authorized air gap is indicated in the brakes manual in Appendix 1.

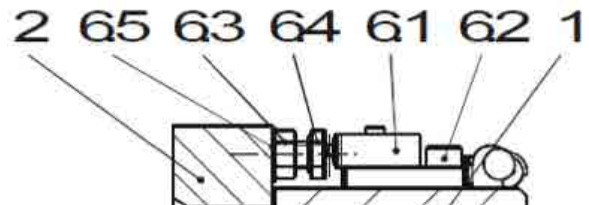
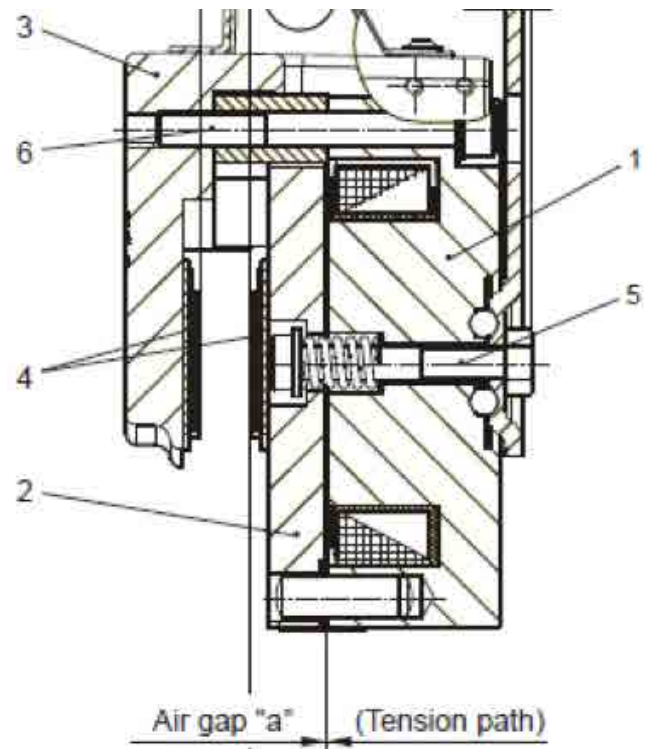
GEARLESS Z6 - Z20

A.C. drive for lift

7 - ADJUSTMENT OF THE MICRO SWITCH

Please see comments at the beginning of chapter 5.

- Put the feeler gauge 0.25mm between brake armature disk (2) and the coil carrier (1) which is also called airgap "a" area
 - for this use 3 feeler gauges in 120° direction one of the 3 should be inserted in the area close to micro switch.
- Energize the brake
- Turn the hexagon head screw (6.4) until the switch show signal
- Tighten the hexagon nut, so that the hexagon head screw is placed under pre-tension by the spring washer.
- Recheck setting: Remain the 3 feeler gauges 0.25mm in place and energize the brake. Micro switch should give signal. In de-energized brake condition the micro switch should give no signal. Finally repeat brake on/off (energize/de-energize) 3 times and recheck switch change condition.
- Final recheck of setting: Insert feeler gauge 0.3mm between brake armature disk (2) and the coil carrier (1) which is also called airgap "a" area (use also 3 feeler gauges in same position than before). With the 0.3mm feeler gauge the switch should give no signal even in brake energized and also no in brake de-energized condition.



GEARLESS Z6 - Z20

A.C. drive for lift

8 - REPLACING THE ENCODER

Secure the load before any work is carried out on the motor.
Check that no torque is applied to the Gearless rotor.

Equipment required:

- T8 TORX screwdriver
- Flat screwdriver

8.1 - Dismantling the encoder

- Disconnect the encoder.
- Unscrew the 2 encoder fixing screws on the support (no. 1).
- Unscrew the encoder shaft locking screw on the axis (no. 2).
- Take out the encoder (no. 3).

8.2 - Reassembling the encoder

- Fit the new encoder on the shaft extension (no. 3).

Caution: the axis run-out is factory-set and should be < 0.05 mm. If this is not the case, correct by making a lever with a tube and check it using a gauge.

- Tighten the encoder shaft screw on the axis (no. 2) to a torque of 1.1 Nm +/- 0.1 Nm.

- Retighten the 2 encoder fixing screws on the support (no. 1).

Phase in the encoder (see the procedure in the inverter manual).

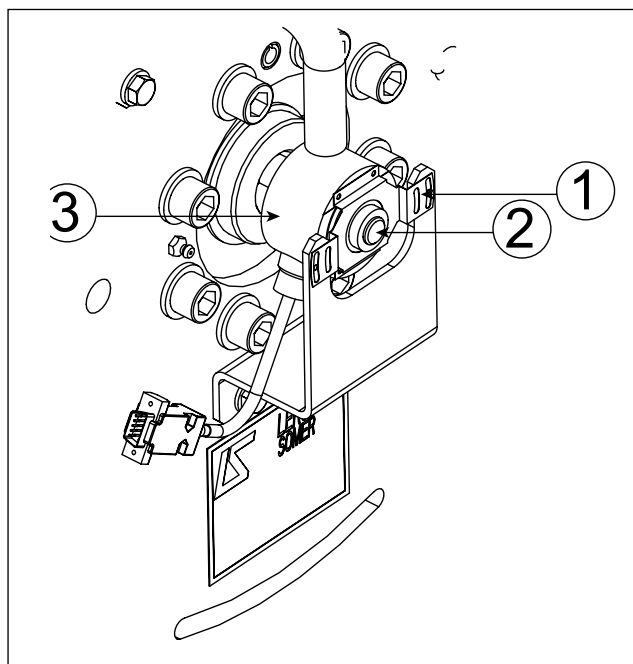
9 - ORDERING SPARE PARTS

To ensure optimum after-sales service, the following information must be provided with each spare parts order:

- Type and serial number of the motor
- and for each spare part:
 - Name and (or) reference number of the part
 - Quantity ordered

For instant identification, please give the reference of the document used for the order (drawing or manual number). The type and serial number can be found on the nameplate of the motor.

Endshields must only be dismantled by an establishment approved by Leroy-Somer.



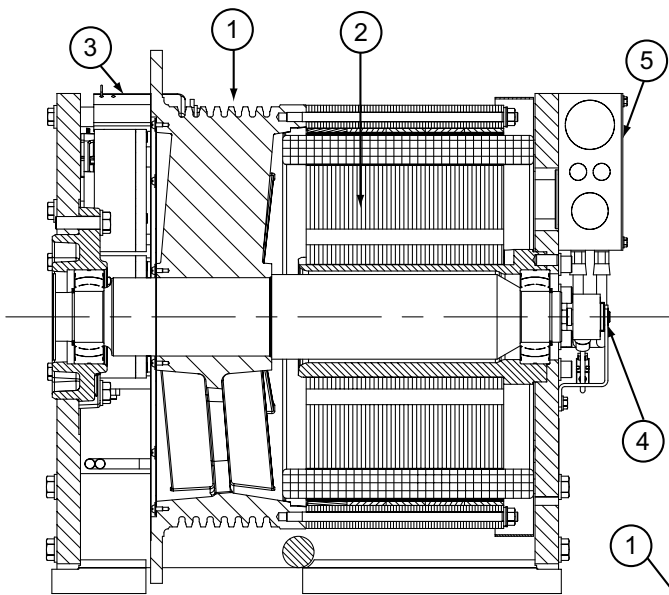
GEARLESS Z6 - Z20

A.C. drive for lift

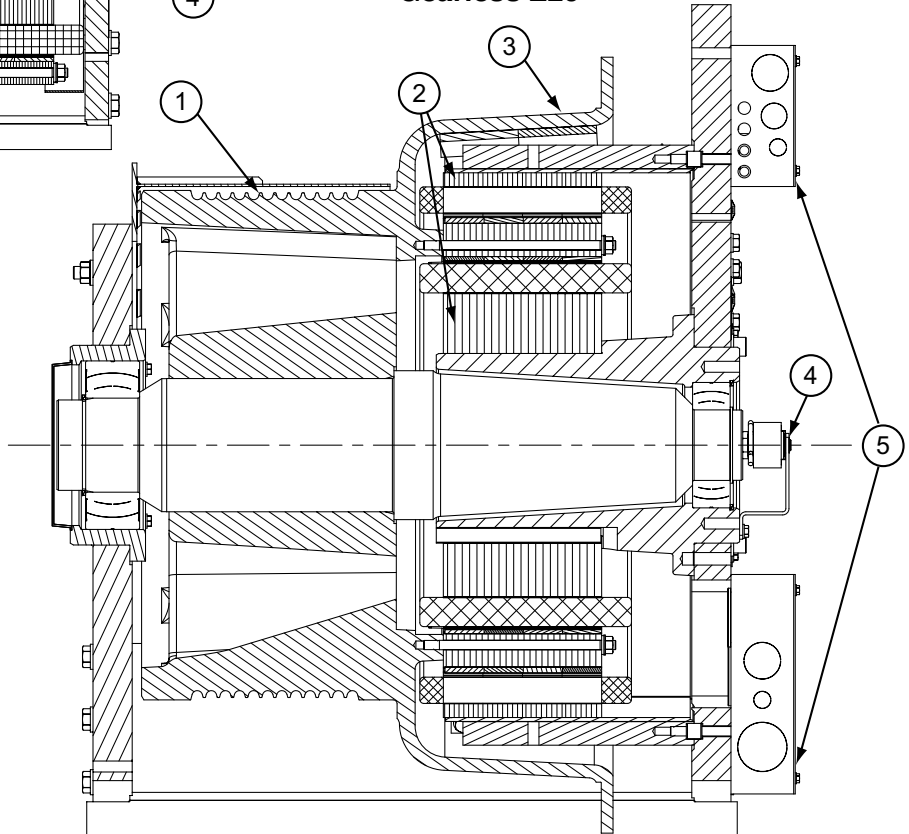
Part names:

No.	Description
1	sheave/magnet rotor
2	Stator
3	Brake
4	Encoder kit
5	Terminal box(es)
Option	CDF brake motor power supply

Gearless Z6 - Z10 - Z12



Gearless Z20



GEARLESS Z6 - Z20

A.C. drive for lift

Installation and Operational Instructions for ROBA[®] -diskstop[®] Type 894.510.03 Size 6

(E089 06 028 000 4 EN)

Design according to
Drawing number: E089 06 028 000 2 10
Article number: 8243144 (52 V design)
8237508 (104 V design)

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:

- Page 1:** - Contents
- Page 2:** - Safety and Guideline Signs
- License (Inspecta)
- Guidelines on EU Directives
- Page 3:** - Safety Regulations
- Page 4:** - Safety Regulations
- Page 5:** - Safety Regulations
- Page 6:** - Brake Illustrations
- Page 7:** - Parts List
- Page 8:** - Table 1: Technical Data
- Page 9:** - Brake Temperature
- Torque-Time Diagram
- Design
- Function
- Scope of Delivery / State of Delivery
- Page 10:** - Installation Conditions
- Table 2: Transverse Forces and Dimension Z1
- Brake Installation
- Installation of the Hand Release Rod Assembly
- Page 11:** - Electrical Connection and Wiring
- Page 12:** - Option: Release Monitoring
- Pin Contact Assignment on the Plug
- Brake Inspection
- Noise Damping
- Page 13:** - Maintenance
- Disposal
- Malfunctions / Breakdowns

Attachment: Assembly Drawing

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.

License (Inspecta)

License number: **08495/2**



Guidelines on the Declaration of Conformity

A conformity evaluation has been carried out for the product (electromagnetic safety brake) in terms of the EC Low Voltage Directive 2006/95/EC. The Declaration of Conformity is laid out in writing in a separate document and can be requested if required.

Guidelines on the EMC Directive (2004/108/EC)

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 %), hexavalent 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 94/9/EC.

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 devices.

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 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.

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 magnetic coils are designed for a relative duty cycle of 100%. However, 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 at an ambient temperature up to 40 °C is 240 1/h. Up to 50 °C, the max. permitted switching frequency is 180 1/h and the max. duty cycle is 40 %.
Between 40 °C and 50 °C, the value is reduced linearly. These values are valid for intermittent periodic duty S3. The permitted surface temperature on the mounting surface must not exceed 70 °C at a max. ambient temperature of 45 °C. The overexcitation time should be at least double the separation time t_2 .
- 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 pads may rust up and seize up in corrosive ambient conditions and/or after longer downtimes.
The user is responsible for taking appropriate countermeasures.

Safety Regulations

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

Dimensioning

Attention!

When dimensioning the brake, please take into consideration whether a load torque is present when selecting the protection.

- Load torques reduce the deceleration torque available.
- Load torques may increase the output speed:
 - during a possible processing time in the controls
 - during the brake downtime

When calculating the friction work, please observe that the brake nominal torque is subject to a tolerance.

Climate Conditions

The electromagnetic brake is suitable for applications with an ambient temperature of between 0 °C and +50 °C.

CAUTION



Reduction in braking torque possible

Condensation can form on the brake and cause a loss in braking torque:

- due to fast changes in temperature
- at temperatures of around or under freezing point

The user is responsible for taking appropriate countermeasures (e.g. forced convection, heating, drain screw).

CAUTION



Brake malfunction possible

Condensation can form on the brake and cause malfunctions:

- at temperatures around or under freezing point, the brake can freeze over and not release any more.

The user is responsible for taking appropriate countermeasures (e.g. forced convection, heating, drain screw).

The system function must be checked by the user after longer downtimes.



At high temperatures and in high humidity or with occurring dampness, the rotor can seize up to the armature disk or the bearing shield / the flange plate after longer downtimes.

CAUTION



Temperatures of over 70 °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 according to EN 81-1:1998+A3:2009.

The safety brake corresponds to DIN EN 81, Part 1 [Sections 9.10.2, 9.11.3, 12.4.2.1 (2nd paragraph), 12.4.2.2, and 12.4.2.5] in its general design and its mode of operation.

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 < 95 %, non-condensing.
- Temperature without major fluctuations within a range from -25 °C up to +55 °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.

Safety Regulations

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

User-implemented Protective Measures:

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

EN ISO 12100

Safety of machinery - General principles for design - Risk assessment and risk reduction

DIN EN 61000-6-4
EN 12016

Interference emission

Interference immunity (for elevators, escalators and moving walkways)

EN 60204-1

Electrical equipment of machines

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

 according to the Low Voltage Directive 2006/95/EC and the Elevator Directive 95/16/EC

Conformity Markings

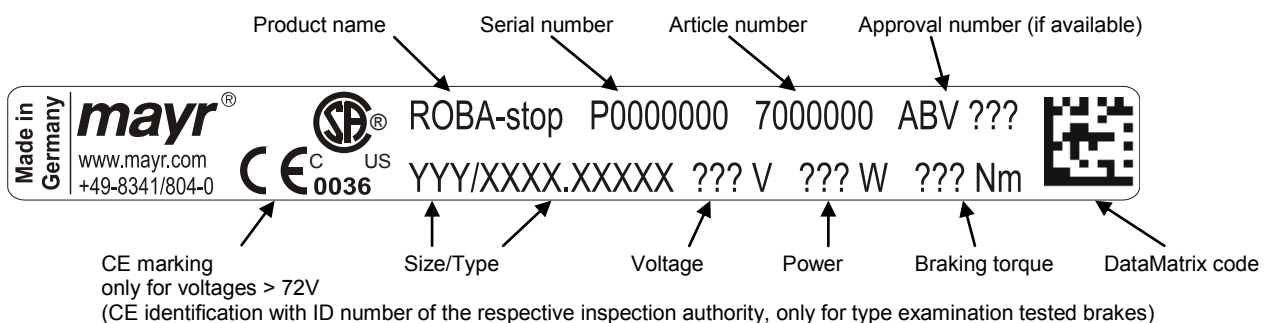
 in terms of the Canadian and American approval

Standards, Directives and Regulations Used

DIN VDE 0580	Electromagnetic devices and components, general specifications
2006/95/EC	Low Voltage Directive
CSA C22.2 No. 14-2010	Industrial Control Equipment
UL 508 (Edition 17)	Industrial Control Equipment
95/16/EC	Elevator Directive
EN 81-1	Safety regulations for the construction and installation of elevators - Part 1: Electrically operated passenger and goods elevators
BGV C1	(previously VGB 70) Safety regulations for theatre stage technical systems

Identification

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



Installation and Operational Instructions for ROBA[®]-diskstop[®] Type 894.510.03 Size 6

(E089 06 028 000 4 EN)

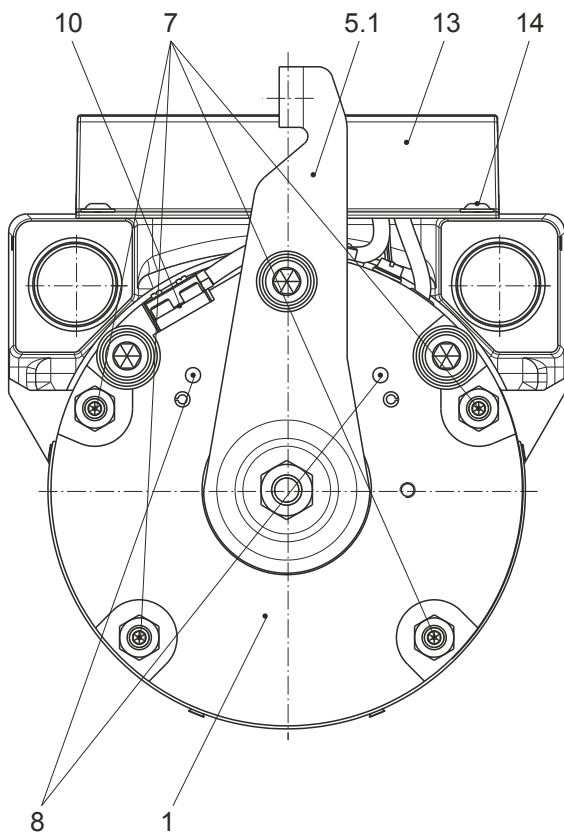


Fig. 1

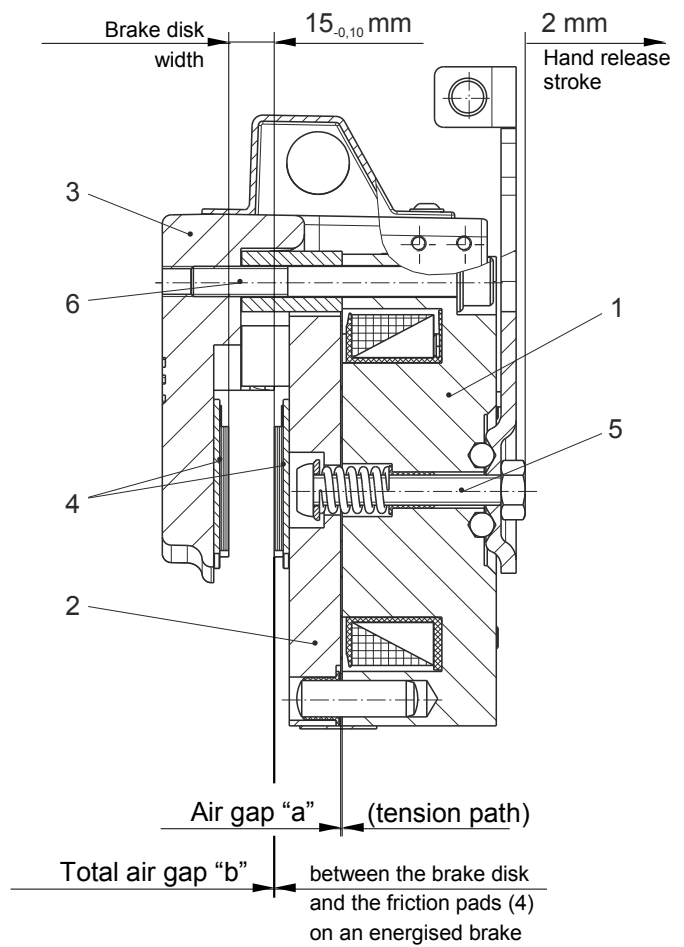


Fig. 2

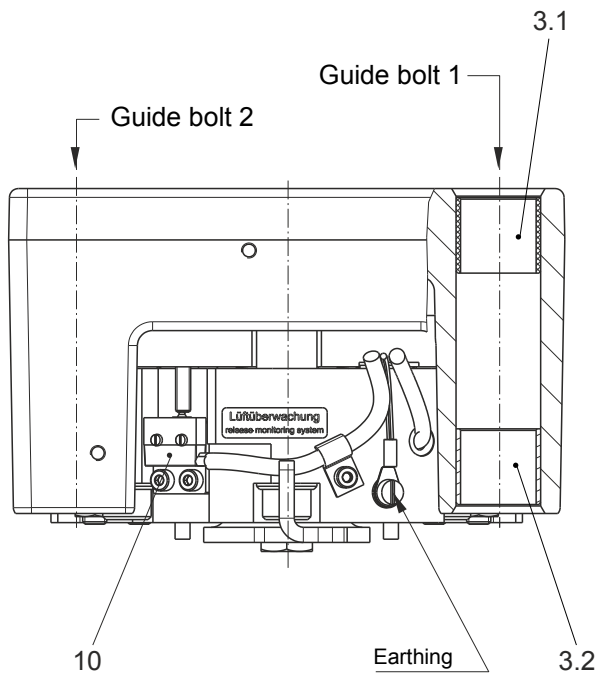


Fig. 3 (View without cable tunnel)

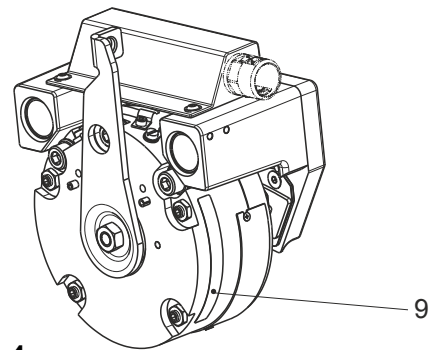


Fig. 4

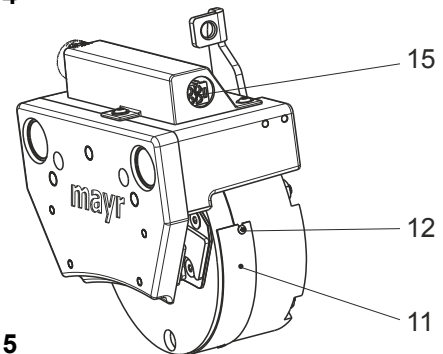


Fig. 5

Installation and Operational Instructions for ROBA[®]-diskstop[®] Type 894.510.03 Size 6

(E089 06 028 000 4 EN)

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

Item	Name	Pcs.
1	Coil carrier assembly with coil	1
2	Armature disk assembly with friction lining	1
3	Brake caliper assembly	1
3.1	Bearing bushing 1	2
3.2	Bearing bushing 2	2
4	Friction pad assembly	2
5	Hand release assembly	1
5.1	Hand release lever	1
6	Cap screw M10 x 70	3
7	Noise damping assembly	4
8	Spring pin	2
9	Type tag	1
10	Release monitoring	1
11	Cover	1
12	Screw M3 x 6	4
13	Cable tunnel	1
14	Flat headed screw M5 x 8	3
15	Plug	1

Installation and Operational Instructions for ROBA[®] -diskstop[®] Type 894.510.03 Size 6

(E089 06 028 000 4 EN)

Table 1: Technical Data

Brake disk diameter:	680 mm	
Min. braking torque (static):	1050 Nm	
Braking torque (dynamic) at nominal speed:	1050 Nm ^{+60 %}	
Nominal speed:	290 rpm	
Max. speed (overspeed):	363 rpm	
Spring force:	4500 ⁺⁴⁰⁰ ₋₂₀₀ N	
Holding voltage (= nominal voltage):	52 V	104 V
Overexcitation (approx. 1 s):	104 V	207 V
Coil power at holding voltage:	39 W	40 W
Coil power at overexcitation:	156 W	162 W
Coil resistance	69.3 Ω	268.5 Ω
Max. circumferential speed:	15 m/s	
Max. friction work Q_r ¹⁾ per braking action:	90000 J	
Brake disk width:	15 _{-0.10} mm	
Nominal air gap "a" (see Fig. 2):	0.55 ±0.05 mm	
Maximum air gap after wear:	0.8 mm	
Total air gap "b" in new condition, with energised brake (Fig. 2).	0.4 ±0.05 mm	
Tightening torque Item 6:	71 Nm	
Protection (electrical):	IP54	
Protection (mechanical):	IP10	
Duty cycle with 240 switchings per hour:	60 %	
Hand release stroke:	2.0 mm	
Ambient temperature ²⁾ :	0 °C to +55 °C	
Mass:	14.8 kg	
Switching times (typical):		
Separation time t_2 :	150 ms	
Connection time t_1 (AC switching):	500 ms	
Connection time t_1 (DC switching):	75 ms	

CAUTION



If the brake is operated with air gap "a" > 0.8 mm, it becomes a safety risk as the braking effect is no longer given because the armature disk (2) lies against the hand release (5).



¹⁾ Please Observe!

The max. friction work $Q_{r,max}$ is valid for rare EMERGENCY STOP braking actions, up to 6 switchings per hour. The thermic load for higher switching frequencies cannot be specified for a brake. 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.



²⁾ Please Observe!

At temperatures under +10 °C and over +45 °C, function limitations can occur.

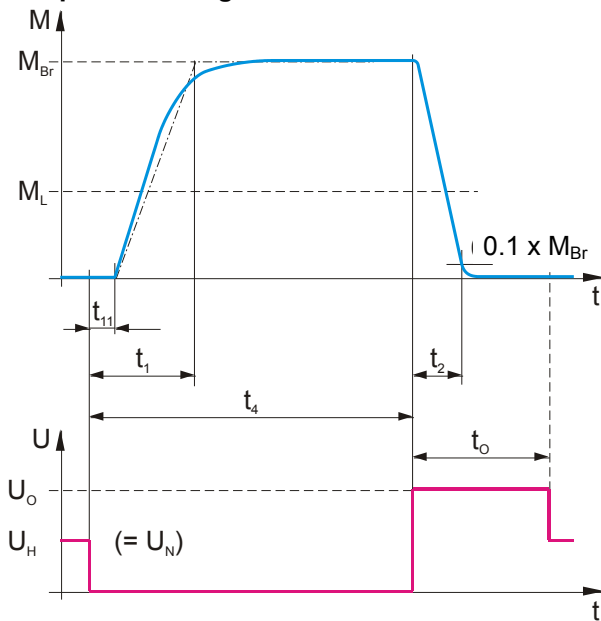
Brake Temperature

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!

Torque-Time Diagram



Key

M_{Br}	=	Braking torque
M_L	=	Load torque
t_1	=	Connection time
t_{11}	=	Response delay on connection
t_2	=	Separation time
t_4	=	Slip time + t_{11}
t_o	=	Overexcitation time
U_N	=	Coil nominal voltage
U_H	=	Holding voltage
U_O	=	Overexcitation voltage

Design

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

Function

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

Spring applied function:

In de-energised condition, thrust springs 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 brake function:

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 brake is manufacturer-assembled ready for installation. The following are included loose in delivery: Cable tunnel (13) and flat headed screws (14).

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

mayr® will take no responsibility for belated complaints. Please report transport damage immediately to the deliverer. Please report incomplete delivery and obvious defects immediately to the manufacturer.

Installation and Operational Instructions for ROBA[®]-diskstop[®] Type 894.510.03 Size 6

(E089 06 028 000 4 EN)

Electrical Connection and Wiring



The brake must only be operated with overexcitation (see Technical Data).

DC current is necessary for operation of the brake. The coil voltage is indicated on the Type tag as well as on the brake body and is designed according to the DIN IEC 60038 ($\pm 10\%$ tolerance). 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.

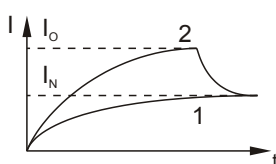
Field Build-up with Normal Excitation

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.

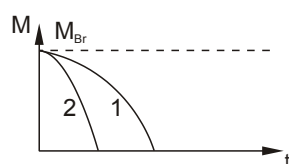
Field Build-up with Overexcitation

A quicker drop in braking torque is achieved if the coil is temporarily placed under a higher voltage, 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



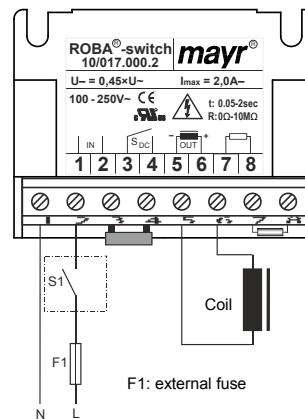
Braking torque path



Magnetic Field 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.

AC-side Switching

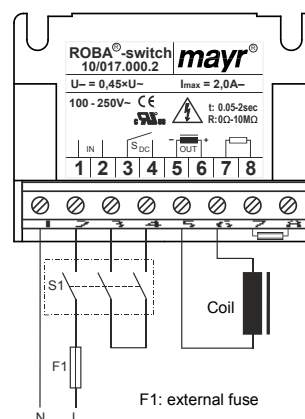


The power circuit is interrupted in front of the rectifier. The magnetic field slowly reduces. This delays the rise in braking torque.

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

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

DC-side Switching



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

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

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

Protection Circuit

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

Release Monitoring (Item 10 / Fig. 1)



Please carry out a functional inspection before brake initial operation!

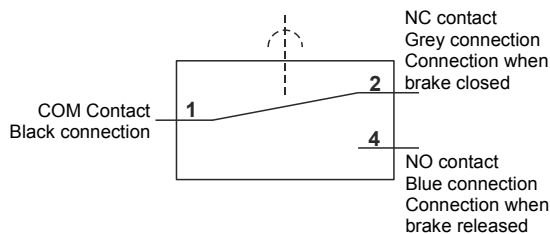
The ROBA®-diskstop® is supplied with manufacturer-side adjusted release monitoring.

A microswitch registers every brake condition (brake released 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), a 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!

Pin Contact Assignment on the Plug (15)

- Pin contact 1: Magnetic coil (blue)
- Pin contact 2: Magnetic coil (brown)
- Pin contact 3: Earthing strand
- Pin contact 4: Microswitch [NO] (blue)
- Pin contact 5: Microswitch [COM] (black)
- Pin contact 6: Microswitch [NC] (grey)

Brake Inspection

The full set braking torque is not achieved until after the run-in procedure has been carried out.

The 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 (acc. DIN VDE 0580/07.2000).

Noise Damping (Item 7 / Fig. 1)



The noise damping used here 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.) and must be routinely or after excessive switching noise levels re-adjusted or replaced.

This may only be carried out by qualified and authorized specialists and should therefore be done at the site of manufacture.

Installation and Operational Instructions for ROBA®-diskstop® Type 894.510.03 Size 6

(E089 06 028 000 4 EN)

Maintenance

The ROBA®-diskstop® is mainly maintenance-free. The friction lining pairing is robust and wear-resistant. This ensures a particularly long service lifetime. However, the friction linings are subject to functional wear. Therefore, please carry out regular friction lining inspections.

The average air gap between the coil carrier (1) and the armature disk (2) on a warm brake must not exceed a maximum of 0.8 mm.

The air gap re-adjustment as well as all other maintenance work is to be carried out at the manufacturers.

Disposal

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

Electronic components

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

Brake bodies made of steel pads with coil /cable and all other steel components:

Steel scrap (Code No. 160117)

All 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):

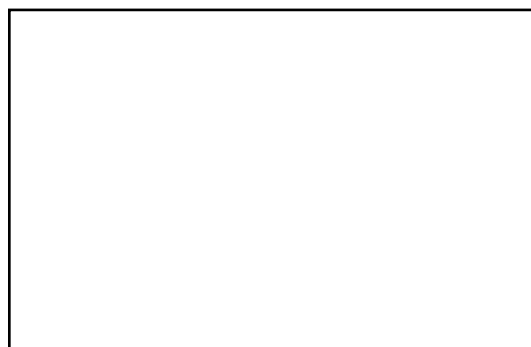
Plastic (Code No. 160119)

Malfunctions / Breakdowns

Result of 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 Maintenance at the place of manufacture 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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