Installation and Operational Instructions for ROBA®-diskstop®
Type 894._ _ _._ _ Size 10 (B.8.4.4.GB)

Please read these Operational Instructions carefully and follow them accordingly!
Ignoring these Instructions can lead to lethal accidents, malfunctions, brake failure and damage to other parts.

Contents:

Declaration of Conformity

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

Safety and Guideline Signs

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

Please Observe!
Guidelines on important points.

Danger!
Danger of injury to personnel, in particular due to hot surfaces.

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

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mayr® Antriebstechnik

Safety Regulations

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

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

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

Danger!

This warning applies if:

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

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

Please Observe!

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

Appointed Use

mayr® brakes are for use in machines and systems and must only be used in the situations for which they are ordered and confirmed.
Using them for any other purpose is not allowed!

Guidelines for Electromagnetic Compatibility (EMC)

In accordance with the EMC directives 2004/108/EC, the individual components produce no emissions. However, functional components e.g. mains-side energisation of the brakes with rectifiers, phase demodulators, ROBA®-switch devices or similar controls can produce disturbance which lies above the allowed limit values. For this reason it is important to read the Installation and Operational Instructions very carefully and to keep to the EMC directives.

Device Conditions

Please Observe!
When dimensioning the brakes, please remember that installation situations, braking torque fluctuations, permitted friction work, run-in behaviour and wear as well as general ambient conditions can all affect the given values. These factors should therefore be carefully assessed, and alignments made accordingly.

Please Observe!

- ❒ Mounting dimensions and connecting dimensions must be adjusted according to the size of the brake at the place of installation.
- ❒ The magnetic coils are designed for 100 % duty cycle. However, a switch-on duration of > 60 % duty cycle results in increased temperatures, which cause premature aging on the noise damping system and therefore an increase in switching noise. The max. permitted switching frequency is 240 1/h. If the brakes are overexcited, a switching frequency of 180 1/h must not be exceeded.
  These values apply for intermittent duty S3 60%. The permitted surface temperature on the brake flange must not exceed 80 °C and a max. ambient temperature of 45 ° C.
  The duration of overexcitation should be approx. 1 second.
- ❒ The brakes are only designed for dry running.
  The torque is lost if the friction surfaces come into contact with oil, grease, water or similar substances.
- ❒ The braking torque is dependent on the present run-in condition of the brakes.
- ❒ Manufacturer-side corrosion protection of the metal surface is provided.

Protection Class I

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

Protection (mechanical) IP 12

Protection against large body surfaces and large foreign bodies > 50 mm in diameter. Protection against dripping water if the housing is inclined by up to 15°.

Protection (Electrical) IP 54:

Dust-proof and protected against contact as well as against water spray from all directions.

Ambient Temperature –10 °C up to +45 °C

Danger!
At temperatures of around or under freezing point, condensation can strongly reduce the torque, or the friction pads can freeze up. The user is responsible for taking appropriate counter measures.

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Safety Regulations

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Brake Storage

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

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

Handling

Before installation, the brake must be inspected and found to be in proper condition. The brake function must be inspected both once installation has taken place as well as after longer system downtimes, in order to prevent the drive starting up against possibly seized linings.

Insulation Material Class F (+155 °C)

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

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.
- ❑ Protect against electric shocks by installing a conductive connection between the magnetic component and the PE conductor on the permanent installation (Protection Class I) and by carrying out a standardised inspection of the continuous PE conductor connection to all contactable metal parts.
- ❑ Protect against highly inductive switch-off peaks by installing varistors, spark quenching units or similar devices according to VDE 0580/2000-07, Paragraph 4.6, to prevent damage to the coil insulations or switch contact consumption in extreme conditions (this protection is contained in *mayr*® rectifiers).
- ❑ Install additional protective measures against corrosion if the brake is subject to extreme ambient conditions or is installed in open air conditions, unprotected from the weather.
- ❑ Take precautions against freeze-up of the friction surfaces in high humidity and at low temperatures.

Regulations, Standards and Directives Used:

DIN VDE 0580	Electromagnetic devices and components, general directives
2006/95/EC	Low voltage directive
89/336/EEC	EMC directive
95/16/EC	Elevator directive
EN 81-1	Safety regulations for construction and installation of elevators and small goods elevators

Please Observe the Following Standards:

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

Liability

- ❒ The information, guidelines and technical data in these documents were up to date at the time of printing.

  Demands on previously delivered brakes are not valid.
- ❒ Liability for damage and operational malfunctions will not be taken if
  - the Installation and Operational Instructions are ignored or neglected.
  - the brakes are used inappropriately.
  - the brakes are modified.
  - the brakes are worked on unprofessionally.
  - the brakes are handled or operated incorrectly.

Guarantee

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

Conformity Markings

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

Identification

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

Manufacturer

***mayr*®**

Name/Type

Article number

Serial number

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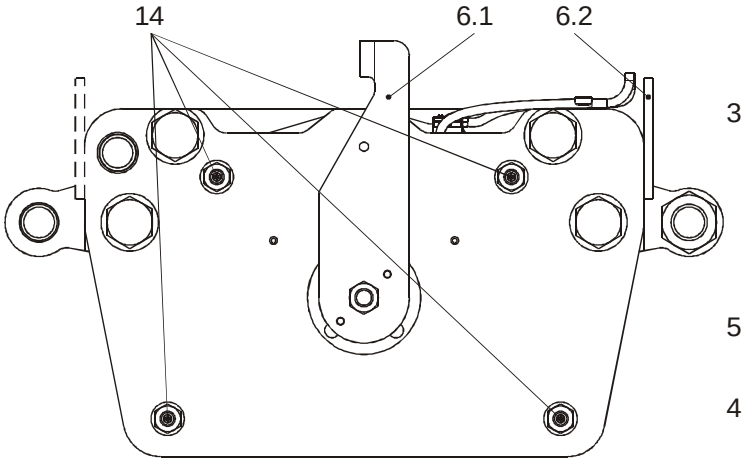

Fig. 1

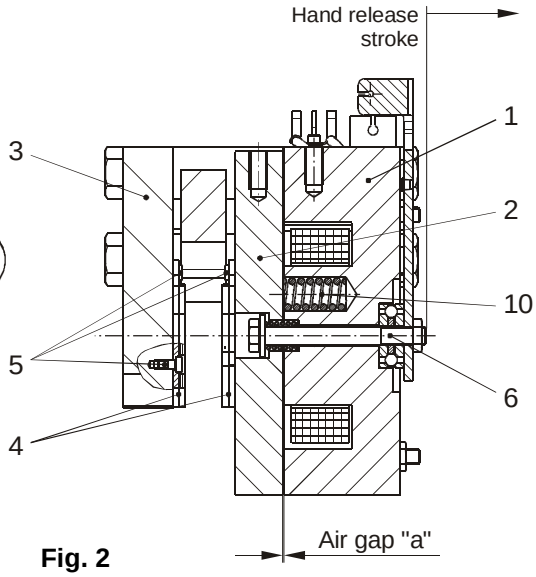

Fig. 2

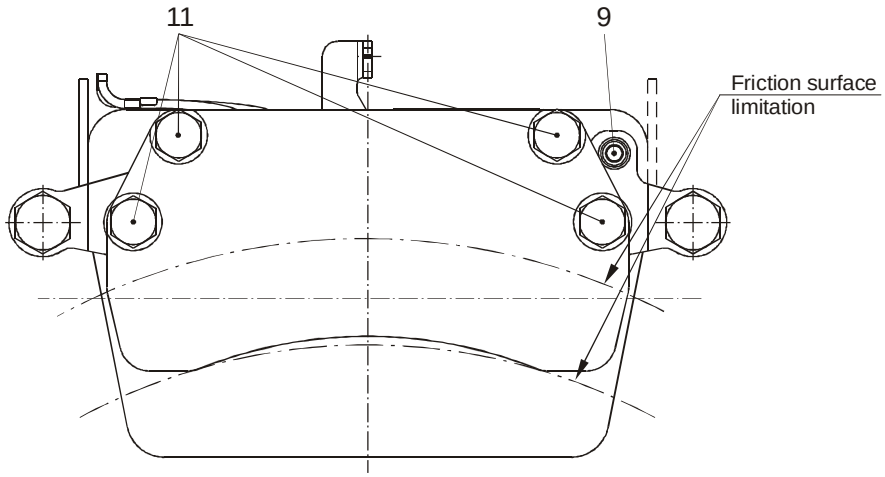

Fig. 3

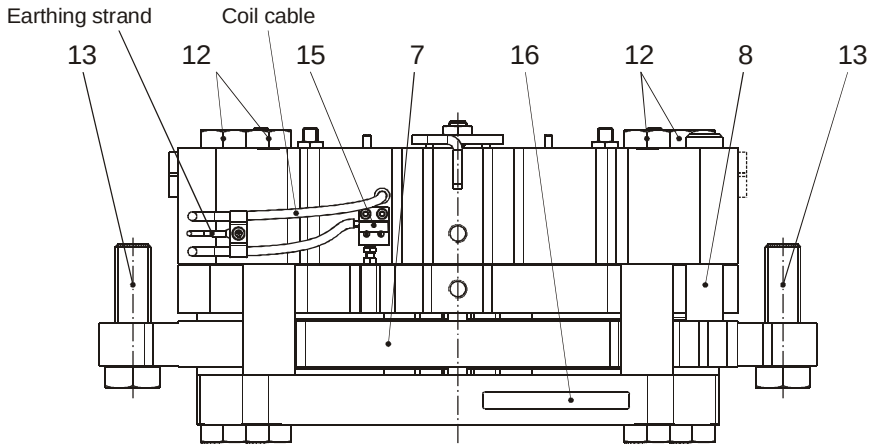

Fig. 4

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

1	Coil carrier assembly with coil
2	Armature disk
3	Counterplate
4	Friction pad assembly (4x)
5	Cap screw M6 x 12 (24x)
6	Hand release assembly
6.1	Hand release lever
6.2	Lock washer
7	Pad
8	Guide bolt
9	Cap screw M12 x 35
10	Thrust spring (17x)
11	Hexagon head screw M20 x 60 (4x)
12	Hexagon head screw M20 x 90 (4x)
13	Hexagon head screw M24 x 80 (2x)
14	Noise damping assembly (4x)
15	Release monitoring assembly
16	Type tag

Table 1: Technical Data

Braking torque (tolerance: 0 / +60 %): for brake disk diameter 950 mm	4611 Nm
Nominal voltage:	104 V
Overexcitation (c. 1 s):	207 V
Coil capacity at nominal voltage:	98 W
Coil capacity on overexcitation:	392 W
Max. circumferential speed:	25 ms^{-1}
Brake disk width (+0 / -0,15 mm):	25 – 30 mm
Brake disk diameter:	950 mm
Braking torque	4611 Nm
Protection (electrical):	IP 54
Protection (mechanical):	IP 12
Duty cycle with 300 switchings per hour:	60 %
Electrical connection for coil:	2 x 0,88 mm^2
Electrical connection of the microswitch:	3 x 0,5 mm^2
Hand release force:	400 N
Hand release stroke:	3 mm
Tightening torque Item 5:	10 Nm
Tightening torque Item 9:	83 Nm
Tightening torque Items 11/12:	410 Nm
Tightening torque Item 13:	710 Nm
Ambient temperature *:	-10 °C to +45 °C
Weight:	76 kg
Switching times (typical):	
Tightening t_2:	400 ms
Drop-out t_1 (AC):	700 ms
Drop-out t1 (DC):	130 ms

*** Please Observe!**
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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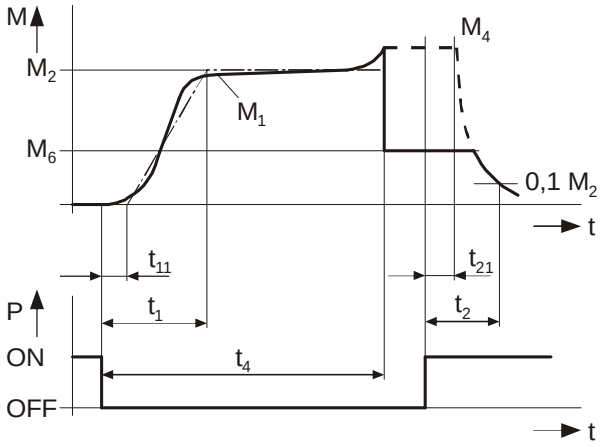
Torque-Time Diagram



Key:

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

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!

Design

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

Function

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

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

State of Delivery:

The brake is manufacturer-assembled.
Please check the state of delivery immediately.
***mayr*® will take no responsibility for belated complaints.**

Please report:
- **Transport damage immediately to the deliverer.**
- **Incomplete delivery and obvious defects to the manufacturer.**

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Installation Conditions

Before mounting the brake, please observe:

- ❑ Axial run out deviation of the brake disk: max. 0,2 mm

Please Observe!
Due to axial run out or tilting between the brake and the brake disk, the brake disk may grind 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.
- ❑ Please keep to the distance of 1,5 ±0,5 mm between the screw-on surface and the brake disk.
- ❑ The screw-on surface must be 0,2 mm parallel to the brake disk in the ∅ 50 mm area.
- ❑ Position tolerance for installation threaded holes ∅ 0,5 mm.
- ❑ Keep the brake surfaces and the friction linings grease-free!
- ❑ Please ensure a suitable protective cover on the open brake.

Brake Installation (Figs. Page 4)

The brake is partly assembled manufacturer-side.

1) The screw connection must be capable of transferring any transverse forces occurring safely; the tensile strength R_m on the mounting wall must be at least 300 N/mm², and the screw-in depth of both fixing screws (13) must be at least 25 mm. The screw tightening torque is 710 Nm.
2) Release the brake mechanically using a suitable device.
3) Push the released brake over the brake disk and position it so that both the fixing screws (13) can be screwed in. Screw tightening torque 710 Nm.
4) Remove the device for releasing the brake.
5) Loosen the fixing screw on the guide bolt (8).
6) Switch the brake 3-4 times so that it aligns with the brake disk.
7) De-energise the brake.
8) Carefully tighten the guide bolt once more. Avoid producing tension if possible. Tightening torque 83 Nm.
9) Check that the brake moves axially on the pad (7). Turn the brake disk and check that it runs smoothly.
10) De-energise the brake.

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

1) Brake is screwed onto motor.
2) Loosen the fixing screw on the guide bolt (8).
3) Release the brake electrically and lift at the coil carrier (1).
4) Insert feeler gauges t ~ 0,4 mm between the friction lining and the brake disk; at the top on the counterplate (3) side and at the bottom on the armature disk (2) side.
5) Tighten the fixing screw on the guide bolt carefully again. Cause as little tension as possible. Screw tightening torque 83 Nm.
6) Remove the feeler gauge.
7) Check the brake for axial smooth running on the pad (7).
8) Turn the brake disk and check that it runs smoothly.
9) De-energise the brake.

Installation Bowden Cable Hand Release

The hand release is partly 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 c. 30°. Adjust the Bowden cable so that the hand release can pivot back to the middle position (after actuation) **=> Functional inspection**.

Brake Inspection

The full set braking torque is not achieved until after the run-in procedure has been carried out.
The braking torque (switching 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/ 10.94).

Noise Damping (14) (Fig. 1):

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

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Electrical Connection and Wiring

Danger!
The brake must be operated with overexcitation

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

Earthing Connection

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

Device Fuses

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

Switching Behaviour

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

Magnetic Field Build-up

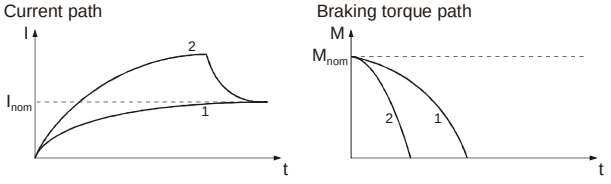
When the voltage is switched on, a magnetic field is built up in the brake coil, which attracts the armature disk to the coil carrier and releases the brake.

- **Field Build-up with Normal Excitation**

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

- **Field Build-up with Overexcitation**

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



Operation with overexcitation requires an inspection of :
- The required overexcitation time*
- The RMS coil capacity** with a cycle frequency larger than 1 cycle per minute.

*** Overexcitation time t_{over}**

Increased wear, and therefore an increasing air gap as well as coil heating lengthen the separation time t_2 for the brake. For this reason, at least double the separation time t_2 must be selected for nominal voltage t_{over}

**** RMS coil capacity P_{RMS}**

$P_{RMS} \leq P_{nom}$
The coil capacity P_{RMS} must not be larger than P_{nom}. Otherwise the coil may fail due to thermal overload.

Calculations:

P_{RMS} [W] RMS coil capacity dependent on switching frequency, overexcitation, reductions in capacity and duty cycle

$$P_{RMS} = \frac{P_{over} \times t_{over} + P_{hold} \times t_{hold}}{t_{tot}}$$

P_{nom} [W] Coil nominal capacity (Catalogue information, Type tag)

P_{over} [W] Coil capacity on overexcitation

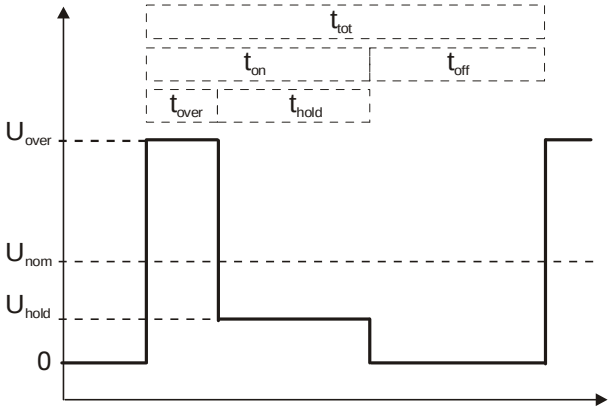
$$P_{over} = \left(\frac{U_{over}}{U_{nom}}\right)^2 \times P_{nom}$$

P_{hold} [W] Coil capacity at reduced capacity

$$P_{hold} = \left(\frac{U_{hold}}{U_{nom}}\right)^2 \times P_{nom}$$

t_{over} [s] Overexcitation time
t_{hold} [s] Time of operation with reduction in capacity
t_{off} [s] De-energised time
t_{tot} [s] Total time ($t_{over} + t_{hold} + t_{off}$)
U_{over} [V] Overexcitation voltage (bridge voltage)
U_{hold} [V] Holding voltage (one-way voltage)
U_{nom} [V] Coil nominal voltage

Time Diagram



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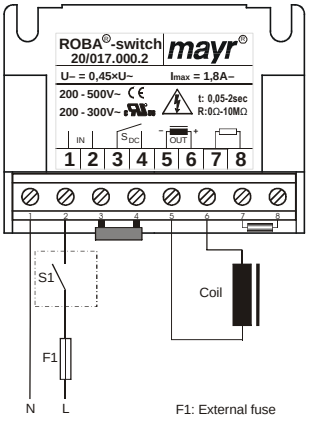
Magnetic Field Removal

- **AC-side Switching**



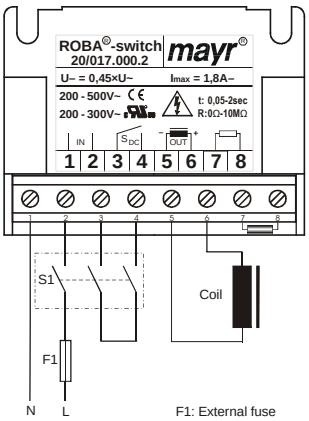
F1: External fuse

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

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

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

- **DC-side Switching**



F1: External fuse

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

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

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

- **Protective Circuit**

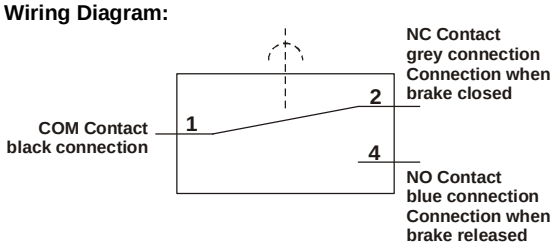
When using DC-side switching, the coil must be protected by a suitable protective circuit according to VDE 0580, which is integrated in *mayr*® rectifiers. To protect the switching contact from consumption when using DC-side switching, additional protective measures are necessary (e.g. series connection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

Release Monitoring (Item 15 / Fig. 1 / optional)

Please carry out a functional inspection before brake initial operation!

The ROBA®-diskstop® is supplied optionally with manufacturer-side adjusted release monitoring.
A microswitch records the 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.

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 and the brake is released.

Table 2: Microswitch Specifications

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

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

Please Observe!
The switching contacts are designed so that they can be used for both low and medium switching capacities. However, after switching a medium switching capacity it is no longer possible to switch low switching capacities reliably.
For switching inductive, capacitative and non-linear loads, use the appropriate protection circuit in order to protect the contacts from electric arches and unpermitted loads!

Please Observe!
Microswitches cannot be guaranteed fail-safe. Therefore, please ensure appropriate access for replacement or adjustment.

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Maintenance

The ROBA®-diskstop® is mainly maintenance-free.
The friction linings are robust and wear-resistant. This ensures a particularly long service lifetime.
However, the friction linings are subject to functional wear.
Therefore, the following inspections are to be carried out at regular inspection intervals:
The friction pads (4) must be replaced when air gap "a" > 2,0 mm is reached between the coil carrier (1) and the armature disk (2) on a hot brake

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

Disposal

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

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

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

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

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:

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

Please Observe!
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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