

Spring applied, electromagnetic safety brake

BRE 800
Protection IP55 / IP66
(Mayr ROBA-stop[®]-M 500 Double rotor brake)

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**Translation of the Original Operational
Instructions**

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Installation and Operational Instructions for ROBA-stop®-M brake Type 891.01 _._ Size 500

(E070 10 172 000 4 EN)

Design according to

Drawing number: E070 10 172 000 211

Type 891.01_.0

Protection IP55

Drawing number: E070 10 172 000 213

Type 891.01_.1

Protection IP66

Nord – Size: BRE800

Please read these Operational Instructions carefully and follow them accordingly!

Ignoring these Instructions may lead to malfunctions or to brake failure, resulting in 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.

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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.



Guidelines on the Declaration of Conformity

A conformity evaluation has been carried out for the product (electromagnetic safety brake) in terms of the EU Low Voltage Directive 2014/35/EU and the RoHS 2011/65/EU with 2015/863/EU. The Declaration of Conformity is laid out in writing in a separate document and can be requested if required.

Guidelines on the EMC Directive 2014/30/EU

The product cannot be operated independently according to the EMC Directive.

Due to their passive state, brakes are also non-critical equipment according to the EMC.

Only after integration of the product into an overall system can this be evaluated in terms of the EMC.

For electronic equipment, the evaluation has been verified for the individual product in laboratory conditions, but not in the overall system.

Guidelines on the Machinery Directive 2006/42/EC

The product is a component for installation into machines according to the Machinery Directive 2006/42/EC.

The brakes can fulfil the specifications for safety-related applications in coordination with other elements.

The type and scope of the required measures result from the machine risk analysis. The brake then becomes a machine component and the machine manufacturer assesses the conformity of the safety device to the directive.

It is forbidden to start use of the product until you have ensured that the machine accords with the regulations stated in the directive.

Guidelines on the EU Directive 2011/65/EU (RoHS II) with 2015/863/EU (RoHS III – from 22 July 2019)

These restrict the use of certain hazardous substances in electrical and electronic devices as well as in products / components (category 11), the proper operation of which is dependent on electric currents and electromagnetic fields.

Our electromagnetic products / components fulfill the requirements laid down in the RoHS Directive(s), taking into account the valid exceptions (according to Appendix III and IV RoHS (2011/65/EU) with delegated Directives (EU) 2018/739-741 from 01.03.2018 for Category 11 – until 21 July 2024) and comply with the RoHS.

Guidelines on the ATEX Directive

Without a conformity evaluation, this product is not suitable for use in areas where there is a high danger of explosion.

For application of this product in areas where there is a high danger of explosion, it must be classified and marked according to Directive 2014/34/EU.

Guidelines on the REACH Regulation (EC) No. 1907/2006

of the European Parliament and of the Council concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH). This regulation governs the manufacture, placing on the market and use of chemical substances in preparations and, under certain conditions, also of substances in finished products.

mayr® power transmission exclusively manufactures products (articles: overload clutches, shaft couplings, electromagnetic brakes / clutches, permanent magnet motors and the appropriate control modules / rectifiers) in accordance with the definition in Article 3 of the REACH Regulation.

mayr® power transmission is aware of its responsibility towards the environment and society. As a matter of precaution, we pay attention to particularly critical substances in the supply chain and strive to avoid using any such substances completely or to replace them in the near future.

In compliance with Article 33 of the REACH Regulation, we would like to inform you that in our overload clutches and shaft couplings, electromagnetic brakes / clutches as well as permanent magnet motors, subcomponents with a lead content of > 0.1% are or may be used. These are manufactured from raw materials such as machining steel / copper alloys (e.g. brass, bronze) or aluminum alloys.

Besides high-melting-point (HMP) solders (electronics), this also affects integrated machine elements as well as standard parts (screws / nuts / set screws / pins / etc.) among others, provided that the relevant standards allow this.

For example, lead can occur as an alloying element with more than 0.1 mass percent, based on the respective total mass, in screws and set screws of the following property classes: 4.6, 4.8, 5.8, 6.8, 04, 4, 5, 6, 14H, 17H, 22H, 33H, 45H.

Products made from copper and copper alloys do not fall within the area of applicability of Regulation (EC) No. 1272/2008 of the European Parliament and Council on the Classification, Labeling and Packaging of Substances and Mixtures (CLP Regulation) and are therefore not subject to the classification and labeling obligations.

To our knowledge, when used for their intended purpose and disposed of correctly (recycling), the contained substances pose no threat to health or environment.

We would like to point out that the proportion of lead used here is not prohibited according to the REACH Regulation. It is merely necessary to declare the use of this substance.

Safety Regulations

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

General Guidelines

DANGER



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

Brakes may generate further risks, among other things:



Hand injuries



Danger of seizure



Contact with hot surfaces



Magnetic fields

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

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

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

To prevent injury or damage, only specialist personnel are allowed to work on the components.

They must be familiar with the dimensioning, transport, installation, inspection of the brake equipment, initial operation, maintenance and disposal according to the relevant standards and regulations.



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

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



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

Guidelines for Electromagnetic Compatibility (EMC)

In accordance with the EMC directive 2014/30/EU, the individual components produce no emissions. However, functional components e.g. mains-side energization 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 100 %.
- 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 rotors may rust up and seize up in corrosive ambient conditions and / or after longer downtimes. The user is responsible for taking appropriate countermeasures.

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.

Safety Regulations

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

Climate Conditions

The electromagnetic brake is suitable for applications with an ambient temperature of between -20 °C and +40 °C.

CAUTION



Reduction in braking torque possible

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

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

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

CAUTION



Brake malfunction possible

Condensation can form on the brake and cause malfunctions:

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

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

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



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

Intended Use

mayr[®]-brakes have been developed, manufactured and tested in compliance with the DIN VDE 0580 standard and in accordance with the EU Low Voltage Directive as electromagnetic components. During installation, operation and maintenance of the product, the requirements for the standard must be observed. 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.

Grounding Connection

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

IP54 (Type 891.01_0):

Dust-proof and protected against contact as well as against water spray from any direction.

When installed, under a fan cover provided by the customer, **Protection IP55** is valid: Dust-proof and protected against contact as well as against jet water from a nozzle coming from any direction.

IP66 (Type 891.01_1):

When installed, dust-proof and protected against contact as well as against strong jet water from a nozzle coming 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 -20 °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): classes 1K21; 1Z1; 1B1; 1C2; 1S11; 1M11

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.

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 switching DC-side, the coil must be protected using a suitable protection circuit in accordance with VDE 0580, which is already integrated in mayr[®]-rectifiers and Nord half-wave and bridge 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. 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.

Safety Regulations

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

Standards, Directives and Regulations Used and To Be Applied

DIN VDE 0580	Electromagnetic devices and components, general specifications
2014/35/EU	Low Voltage Directive
2011/65/EU	RoHS II - Directive
2015/863/EU	RoHS III- Directive
CSA C22.2 No. 14-2010	Industrial Control Equipment
UL 508 (Edition 17)	Industrial Control Equipment
EN ISO 12100	Safety of machinery – General principles for design - Risk assessment and risk reduction
DIN EN 61000-6-4	Interference emission
DIN EN 61000-6-2	Interference immunity

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

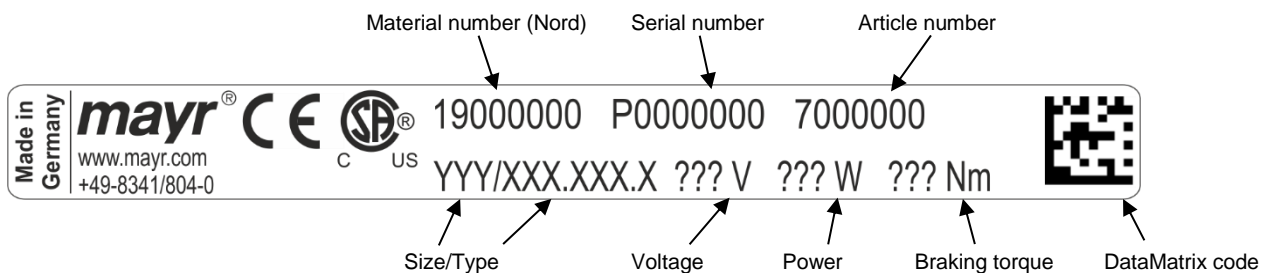
 in accordance with the Low Voltage Directive 2014/35/EU (only in case of voltages > 75 V DC) and / or the RoHS Directive 2011/65/EU with 2015/863/EU

Conformity Markings

 in terms of the Canadian and American approval

Identification

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



Installation and Operational Instructions for ROBA-stop®-M brake Type 891.01 __ Size 500

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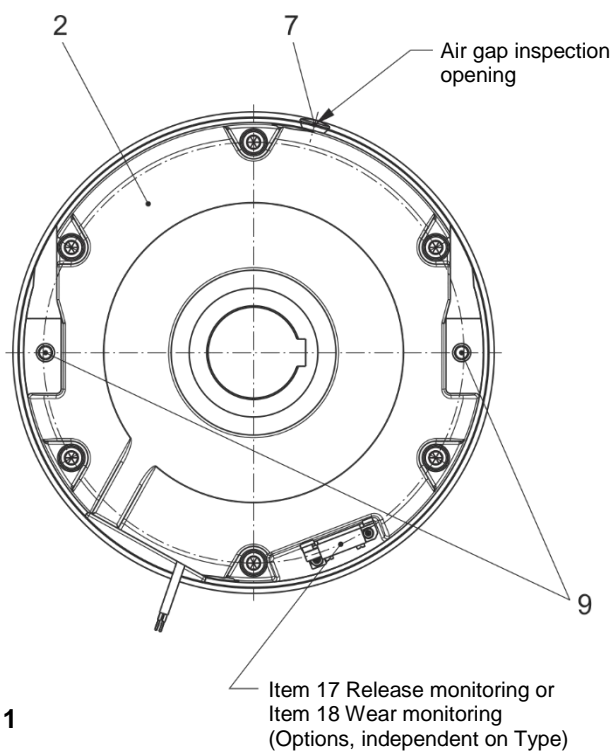


Fig. 1

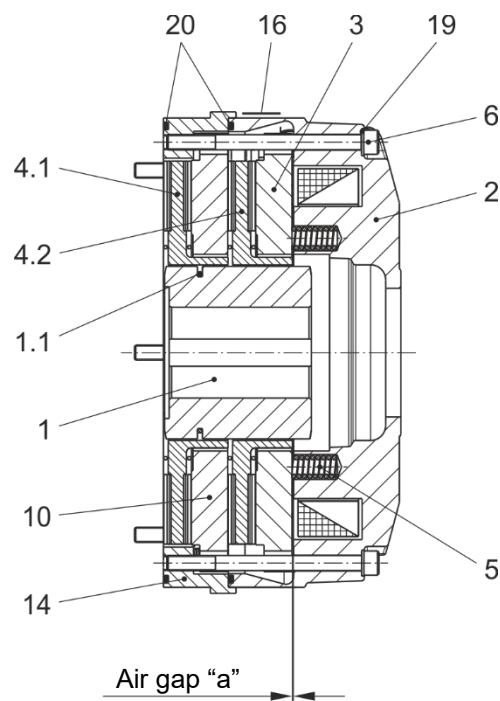


Fig. 2

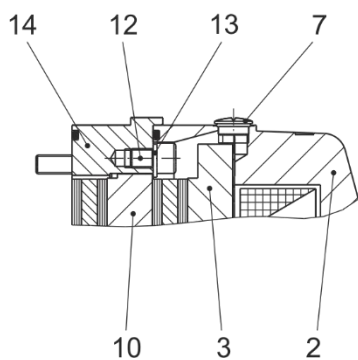


Fig. 3

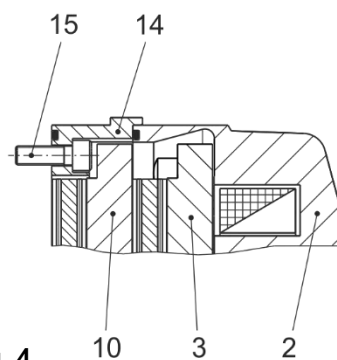


Fig. 4

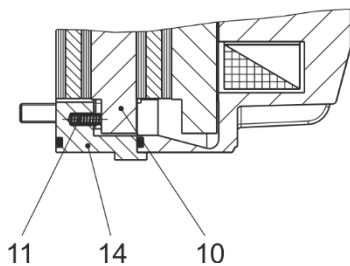


Fig. 5

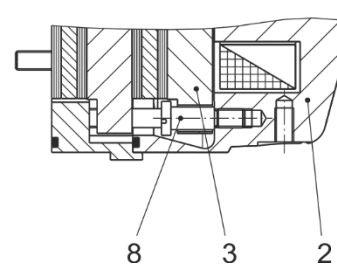


Fig. 6

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.01 _._ Size 500

(E070 10 172 000 4 EN)

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

Item	Name	Pcs.
1	Hub ¹⁾	1
1.1	O-ring ¹⁾	1
2	Coil carrier assembly (with magnetic coil)	1
3	Armature disk	1
4.1	Rotor 1	1
4.2	Rotor 2	1
5	Thrust spring D15 + D24.5 (braking torque)	14 + 2
6	Cap screw M10 x 130 DIN EN ISO 4762	6
7	Screw plug M16 x 1.5 (with O-ring)	1
8	Shoulder screw D18 x 44	2
9	Cone plug (only on Type 891.01_0)	2
10	Intermediate disk	1
11	Thrust spring D6 (for intermediate disk)	3
12	Cap screw M10 x 14 DIN EN ISO 4762	6
13	Washer D20 / 10.5 x 2	6
14	Distance ring	1
15	Cap screw M10 x 30 DIN EN ISO 4762	6
16	Type tag	1
17	Release monitoring (option, independent on Type)	1
18	Wear monitoring (option, independent on Type)	1
19	Bonded seal D10.7 x 17 x 1.5 (only for type 891.01_1)	6
20	O-ring D285 x 4 DIN 3771 (only for type 891.01_1)	2

¹⁾ The hub (1) incl. O-ring (1.1) must be ordered separately



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.

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.01 __ Size 500

(E070 10 172 000 4 EN)

Table 1: Technical Data



For safe and fast brake release, overexcitation is required.

Nominal braking torque:	800 Nm
Braking torque tolerance (conditioned):	+40% / -20%
Braking torque tolerance (without conditioning):	+40% / -30%
Reference speed n_{ref} :	750 rpm
Max. speed n_{max} (brake engagement):	1800 rpm
Permitted idle speed ¹⁾ :	2700 rpm
Nominal voltage U_N :	104 V / 180 V
Overexcitation voltage U_O :	207 V / 360 V
Electrical power at nominal voltage P_N :	150 W
Electrical power on overexcitation P_O :	600 W
Overexcitation time t_O :	1 s
Electrical connection, magnetic coil:	2 x 0.88 mm ²
Mass with hand release and hub:	62.44 kg
Mass without hand release and without hub	53.50 kg
Weight of hub / weight of hand release assembly	4.75 kg / 3.19 kg
Nominal air gap "a" +0.3 (Fig. 2):	0.8 mm
Max. permitted air gap "a" after wear (Fig. 2) ²⁾ :	1.8 mm
Minimal width of the counter friction surface:	19 mm
Tightening torque Item 6:	45 Nm
Tightening torque Item 8:	18.5 Nm
Tightening torque Item 12:	45 Nm
Tightening torque Item 15:	63 Nm
Rotor thickness "new" (+0.08 mm):	18.5 mm
Minimum rotor thickness:	18 mm
Mass moment of inertia (hub + rotor):	420 x 10 ⁻⁴ kgm ²
Friction work $Q_{r 0.1}$ (per 0.1 mm wear):	170 x 10 ⁶ J
Friction work $Q_{r ges.}$ (max. possible friction work related to nominal air gap):	1700 x 10 ⁶ J
Duty cycle:	100 %
Protection (type 891.01 __0):	IP 54 / IP55 ³⁾
Protection (type 891.01 __1):	IP 66
Ambient temperature:	-20 °C to +40 °C

¹⁾ Sporadic braking permitted; see friction work diagram for switching frequency = 1 per hour

²⁾ Customer-side changes of the spring configuration have an effect on the maximum permitted air gap.

³⁾ When installed, under a fan cover provided by the customer, Protection IP55 is valid.

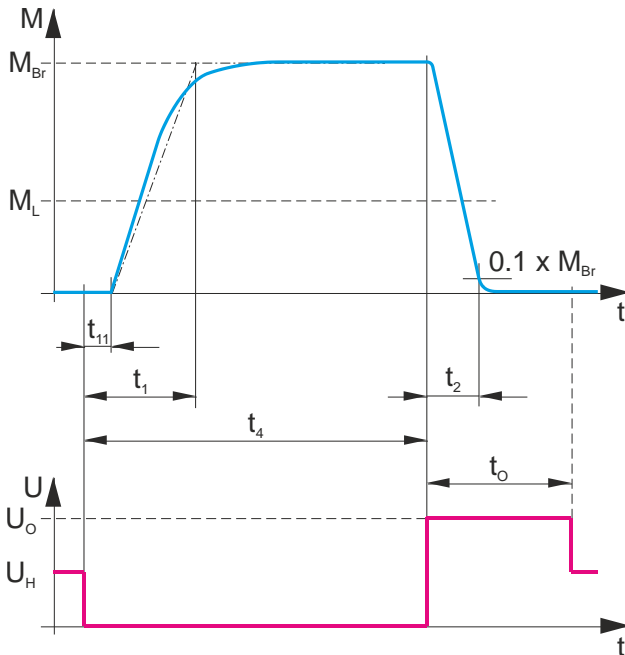


The stated value $Q_{r 0.1}$ is only a reference value for specific friction work values < 0.5 J/mm² and sliding speeds < 10 m/s.

Table 2: Changes in Switching Time t_{11} with Different Spring Configurations

Spring configuration	Braking torque	t_{11}
14 x D15 + 2 x D24.5	800 Nm	100 %
11 x D15 + 2 x D24.5	700 Nm	137.5%

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-stop[®]-M brakes are spring applied, electromagnetic safety brakes, which apply a defined braking effect after the voltage is switched off or after a voltage failure. The brakes can optionally be retrofitted with a hand release (article number 8265888).

Function

The ROBA-stop[®]-M brake is a spring applied, electromagnetic safety brake.

Spring applied function (brake):

In de-energized condition, thrust springs (5) press against the armature disk (3). The rotor 2 (4.2) is held between the armature disk (3) and the intermediate disk (10), the rotor 1 (4.1) between the intermediate disk (10) and the machine wall via frictional locking. The braking torque is introduced into the shaft via the toothing of the rotors (4.1 and 4.2) and the hub (1).

Electromagnetic function (release):

Due to the magnetic force of the coil in the coil carrier (2), the armature disk (3) is attracted against the spring pressure to the coil carrier (2) and the intermediate disk (10) is pressed against the washers (13) via the thrust springs (11). The brake is released and the brake rotors (4.1 and 4.2) with the hub (1) can rotate freely.

Safety brakes:

The ROBA-stop[®]-M brake 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

ROBA-stop[®]-M brakes are pre-assembled. An optional release monitoring device / wear monitoring device is installed and set manufacturer-side. The hand release devices have already been mounted manufacturer-side for designs Type 891.011.1. The hub (1) incl. O-ring (1.1) is not included in the standard scope of delivery and must be ordered separately. Included loose in delivery are:

- rotors (4.1 and 4.2)
- cap screws (6)
- intermediate disk (10)
- thrust springs (11)
- cap screws (12)
- washers (13)
- distance ring (14)
- cap screws (15)

Additional parts for Type 891.01_1:

- bonded seals (19)
- O-ring (20)

The brakes are set manufacturer-side to the braking torque stipulated on order.

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.

Installation Conditions

- ❑ The eccentricity of the shaft end in relation to the mounting pitch circle must not exceed 0.2 mm.
- ❑ The positional tolerance of the threads for the fixing screws of the distance ring (14) must not exceed 0.2 mm.
- ❑ The axial run-out deviation of the screw-on surface to the shaft must not exceed the permitted axial run-out tolerance of **0.125 mm** acc. DIN 42955. The reference diameter is the pitch circle diameter for securement of the brakes. Larger deviations can lead to a drop in torque, to continuous grinding on the rotors (4.1/4.2) and to overheating.
- ❑ The tolerances of the hub bore and the shaft must be selected so that the hub toothing (1) is not widened. Widening of the toothing leads to the rotors (4.1/4.2) jamming on the hub (1) and therefore to brake malfunctions. Recommended hub – shaft tolerance H7/k6. If the hub (1) is heated for better joining, the O-ring (1.1) must be removed beforehand and re-mounted after hub installation. The max. permitted joining temperature of 200 °C must not be exceeded.
- ❑ A suitable counter friction surface (flange surface) made of steel or grey cast iron must be provided for the rotor (4.1). Sharp-edged interruptions on the friction surfaces must be avoided. Surface quality in the friction area of the friction surface: Ra 1.6 µm



When machining grey cast iron, please make sure that the cast tips are removed.

- ❑ The rotors (4.1/4.2) and brake surfaces must be oil and grease-free.
- ❑ The toothings of the hub (1) and the rotors (4.1/4.2) must not be oiled or greased.
- ❑ Please abstain from using cleaning agents containing solvents, as they could affect the friction material.
- ❑ Protect the rotor from rusting up / seizing up against the bearing shield / the flange plate (customer-side). We recommend tried and tested anti-corrosion measures for the mounting surface:
 - ❑ dry, oil-free phosphate layers
 - ❑ hard chromium and nitriding

Installation (Figs. 1 to 7)

1. Mount the hub (1) with the inserted O-ring (Item 1.1 / **O-ring must be lightly greased**) onto the shaft, bring it into the correct position (the length of the key should lie over the entire hub) and secure it axially, e.g. using a locking ring.
2. If necessary (dependent on Type), insert the O-ring (20) into the axial groove of the distance ring (14).
3. Secure the distance ring (14) evenly all around using 6 cap screws (15) **with a torque wrench and a tightening torque of 63 Nm** onto the customer-side flange.
4. Measure the rotor thickness of the new rotors (4.1/4.2). Nominal dimension 18.5_{-0.08} mm must be given.
5. Push rotor 1 (4.1) over the O-ring (1.1) onto the hub (1) by hand using light pressure (the rotor collar should be facing away from the customer flange). The rotor toothing must lie over the entire length of the hub (1). Make sure that the toothing moves easily. Do not damage the O-ring.
6. Insert thrust springs (11) into the 3 respective bores with Ø 6.5 mm in the distance ring (14).
7. Push the intermediate disk (10) with the shoulder (Ø 254 mm) in the direction of the customer flange over the hub (1).
8. Screw the intermediate disk (10) together with the distance ring (14) using cap screws (12) with washers (Item 13 / milled-off part facing outwards) placed under them. **Please observe the tightening torque of 45 Nm.**
9. Push rotor 2 (4.2) by hand onto the hub (1) (the rotor collar should be facing away from the customer flange). The rotor toothing must lie over the entire length of the hub (1). Make sure that the toothing moves easily.
10. If necessary (dependent on Type), insert the O-ring (20) into the axial groove of the coil carrier (2).
11. Push the rest of the brake over the hub (1) and the rotor collar (4.2) (the fixing holes should align with the free threads M10 in the distance ring (14)). The shoulder screws (8) prevent the individual components from falling apart. They do not affect the brake function and must not be removed during installation.
12. Screw the brake and the distance ring (14) together evenly all around using the cap screws (5) and mounted seals (Item 19 / dependent on Type) **with a torque wrench and a tightening torque of 45 Nm.**
13. Check the air gap, see page 15.
14. Establish the electrical connection of the brake.

Hand Release

The brakes are prepared for the optional attachment of a hand release (article number 8265888).



The hand release including separate Installation Instructions can be ordered at the manufacturer's stating the article or serial number of the respective brake.

In order to install the hand release, the brake must be removed from the distance ring (14) and de-energized!

The hand release devices have already been mounted manufacturer-side for designs Type 891.011.1.

Definition of the Braking Torques

Static braking torque

Effectively averaged, fully developed torque for slipping brake with smallest speed values.
Guideline value: $n = 3$ [rpm]

Dynamic braking torque

Effectively averaged, fully developed torque in a braking procedure from the output speed up to standstill.



For correct evaluation, a sufficient slip time is required (sliding speed between 1 m/s and 10 m/s).
The permitted friction work and speed values must not be exceeded.

Braking Torque Adjustment

The ROBA-stop®-M brakes are set manufacturer-side to the braking torque stipulated on order.
The set torque is stated on the Type tag (16).

Run-in Procedure / Conditioning of the Friction Lining Pairing

The stated brake nominal torques are valid for a run-in / conditioned state of the friction lining pairing in standard climate conditions.

When in new condition and without conditioning of the friction pairing, the braking torque tolerance may be +40 % / -30 %

Conditioning is necessary:

- in new condition
- during the operation of the system
- EMERGENCY STOP only after brake run-in procedure

Please carry out conditioning of the friction lining pairing through dynamic braking procedures of the system.

Recommendation:

Please carry out approx. 5 dynamic braking procedures

- at 50 % of the permitted speed n_{max}
- at 25 % of the permitted friction work $Q_{r\ zul}$.

Please observe the following under deviating run-in conditions:

- do not use higher speed and/or friction work values
- at lower friction work values, increase the number of dynamic braking actions to achieve similar total friction works.



A generally valid definition of the parameters required for the conditioning is not possible due to the different application possibilities.

The frequency of the friction lining pairing conditioning and the torque inspection must be determined by **the user** depending on the application.

If regular conditioning is not possible:

Dimension with a correspondingly higher safety.

Recommendation: $S_i \geq 2.0$

Attention! The dynamic dimensioning must be taken into account separately



EMERGENCY STOP only after brake run-in procedure

Brake Inspection (before brake initial operation)

→ Braking torque inspection:

Please compare the requested braking torque with the torque stated on the Type tag (16).

→ Inspect the air gaps:

Air gap "a" (brake de-energized):

The nominal air gap $0.8^{+0.3}$ mm must be given.

→ Release function inspection:

by energizing the brake.

The braking torque is not achieved until after the run-in procedure has been carried out. See section "Definition of the Braking Torques".

Installation and Operational Instructions for ROBA-stop[®]-M brake Type 891.01 __ Size 500

(E070 10 172 000 4 EN)

Electrical Connection and Wiring



The brake must only be operated with overexcitation. The required overexcitation time is min. 1 s.

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 ($\pm 10\%$ 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!

Grounding Connection

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

The reliable operational behavior 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).

Influencing the Switching Time

The same switching time can be used for rectifiers manufactured by Getriebebau Nord and for those manufactured by *mayr*[®] (see Table 2 and section "Protection Circuit").

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.

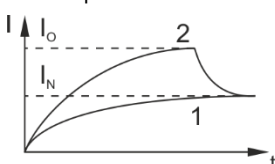
Field build-up with normal excitation

If the magnetic coil is energized 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.

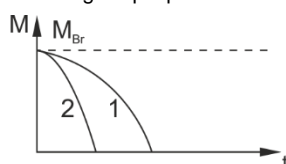
Field build-up with overexcitation

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

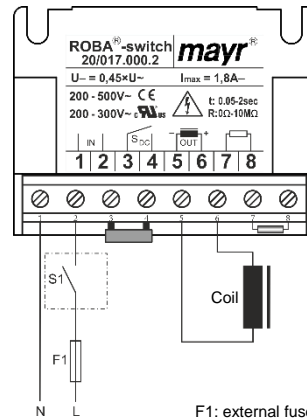


Braking torque path



Magnetic Field Removal

AC-side switching

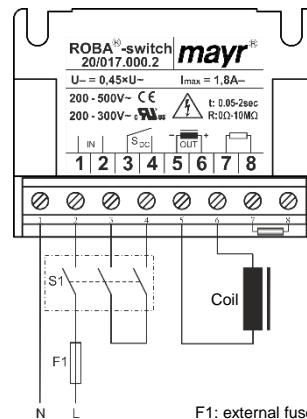


The power circuit is interrupted in front of the rectifier. The magnetic field slowly reduces. This delays the rise in braking torque.

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

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

DC-side switching



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

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

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

Protection Circuit

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

Permitted Brake Friction Work

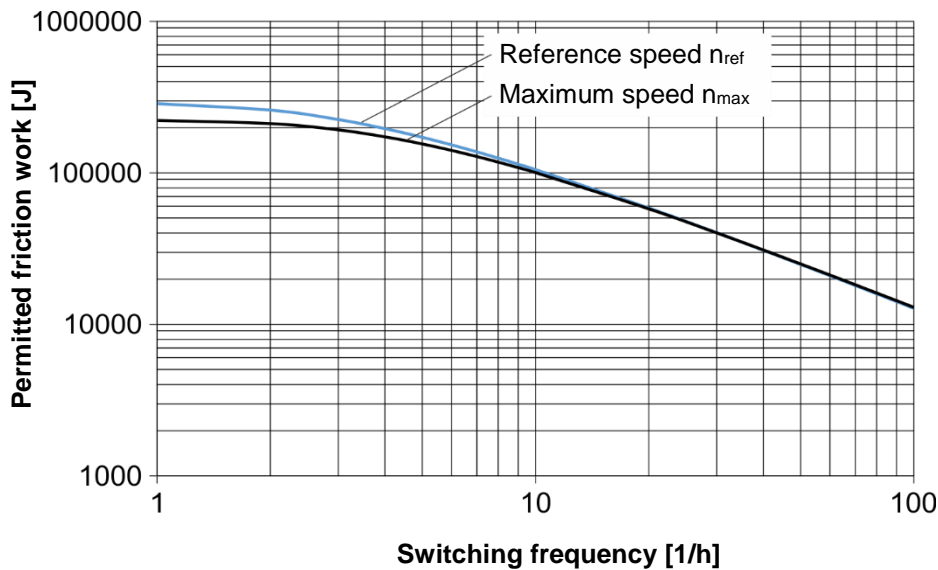
The permitted friction work values dependent on the switching frequency shown in the characteristic curve must not be exceeded, not even in EMERGENCY STOP operation.

The following diagram show the permitted friction work values Q_r referring to the respective switching frequency for the various rated speeds (Table 1).



For 60 Hz operation, the max. permitted friction work values must be reduced to 70 %.

Friction power diagram for RSM 500 – BRE 800



Permitted friction work at other speeds (customer specific)

The permitted friction work at specific customer speeds can also be calculated using linear interpolation between the maximum speed and reference speed.

- Q_n = Permitted friction work at customer speed
- $Q_{n\ ref}$ = Permitted friction work from friction power diagram for reference speed
- $Q_{n\ max}$ = Permitted friction work from friction power diagram for maximum speed
- n = Actual customer speed
- n_{ref} = Reference speed (see Table 1)
- n_{max} = Maximum speed (see Table 1)

$$Q_n = Q_{n\ ref} - \frac{(Q_{n\ ref} - Q_{n\ max})}{(n_{max} - n_{ref})} \times (n - n_{ref})$$

Option: Microswitch for Brake Monitoring (Items 17/18 / Fig. 1)



If you require a release monitoring device or a wear monitoring device, please state this explicitly when ordering your brake.



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!

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)



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

Release Monitoring (Item 17)

The 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".

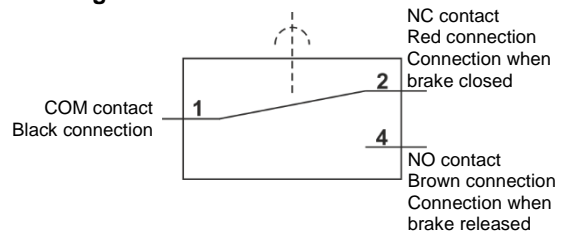
The customer is responsible for a signal evaluation of both conditions.

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

Function

When the magnetic coil is energized in the coil carrier (2), the armature disk (3) is attracted to the coil carrier (2), the microswitch emits a signal, the brake is released.

Wiring Diagram of the Microswitch for Release Monitoring



Customer-side Inspection after Attachment

Carry out a functional inspection before brake initial operation.

for connection as NO contact:

- Brake **de-energized**: Inspection lamp must signal "OFF".
- Brake **energized**: Inspection lamp must signal "ON".

for connection as NC contact:

- Brake **de-energized**: Inspection lamp must signal "ON".
- Brake **energized**: Inspection lamp must signal "OFF".

Wear Monitoring (Item 18)

The brakes are supplied optionally with manufacturer-side installed and adjusted wear monitoring device.

Function

Due to wear on the rotor (4), the air gap "a" between the coil carrier (2) and the armature disk (3) increases.

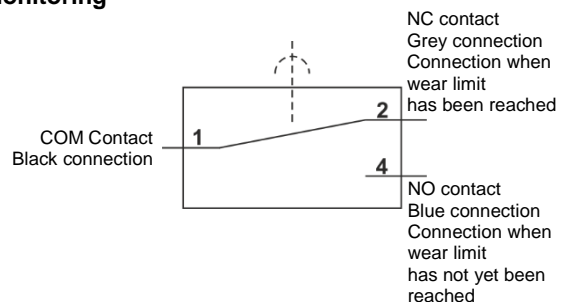
Once the limit air gap of **1.8 mm** has been reached, the microswitch contact switches over and emits a signal. The rotor (4) must be replaced.



Customer-side changes of the spring configuration have an effect on the maximum permitted air gap.

The customer is responsible for a signal evaluation.

Wiring Diagram of the Microswitch for Wear Monitoring



Air Gap Inspection

The air gap can be inspected via a feeler gauge after removing the screw plug (7). The feeler gauge must be inserted at least 40 mm deep (see Fig. 7), so that the distance between the armature disk (3) and the coil carrier (2) can be measured.

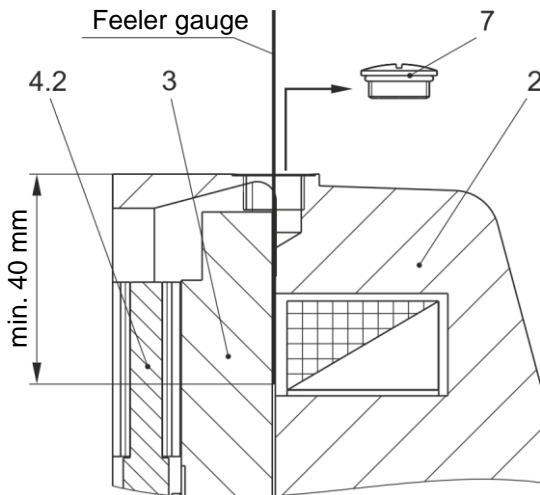


Fig. 7

Maintenance

The amount of wear on the rotors (4.1/4.2) must be examined during the regular inspection intervals:

ROBA-stop®-M brakes are largely maintenance-free.

The friction lining pairing is robust and wear-resistant. This ensures a particularly long service lifetime of the brake. The friction lining is subject to functional wear in case of **EMERGENCY STOP** and during regular conditioning of the friction lining pairing.

In addition to this, further signs of wear may appear:

- Dry-running wear due to the presence of residual friction in the brake.
- Increased wear (depending on speed) in the case of a vertical or pivoting installation position for the motor axis, particularly to the lower friction lining.

If the rotors (4.1/4.2) do become worn due to the high total friction work, and the function of the brake can no longer be guaranteed, the brake can be re-set to its functional state by replacing the rotors.

The quality of the counter friction surface must be checked.

The wear condition of the rotors (4.1/4.2) can be specified by:

- Checking the air gap (see above).
Max. permitted air gap: 1.8 mm.
- Measuring the rotor thickness on the dismantled brake.
Minimum rotor thickness 18 mm.

We recommend the following regular inspection intervals:

Once a year

- Inspection of the air gaps (brake in de-energized condition)

Twice a year or after 1000 operating hours

- Inspection of the rotor thickness (wear).
- Inspection of the toothings of the rotors (4.1/4.2) and the hub (1) for increased backlash and damage and to make sure they move easily.
Max. permitted torsional backlash of the rotors on the hub → 0.3°.
Inspection on an engaged brake and load-free output by turning the motor shaft.
- Inspection of the armature disk (3), the intermediate disk (10) and the customer flange for plane parallelism and wear (excessive formation of scoring).
- Clean the brake.

Replacing the rotors

- After having reached the maximum air gap.
- In safety-critical applications (without cyclical brake test) at the latest after 6 years of operating the system

To be determined by the user

The frequency of the friction lining pairing conditioning and the torque inspection must be determined by the user depending on the application.

In order to maintain the brake torque in holding applications, the friction lining pairing must be conditioned regularly. This must be carried out in the form of dynamic braking procedures.

Afterwards, the brake torque must be checked.

If regular brake conditioning in holding applications is not possible, a higher level of security must be used for dimensioning (recommendation: $S_i = 2.0$ => Please observe: The dynamic dimensioning must be taken into account separately).

Wear times are influenced by many factors and can vary substantially. The required inspection and maintenance intervals must be calculated individually according to the system manufacturer's planning documentation.

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.01 __ __ Size 500

(E070 10 172 000 4 EN)

Replacing the Rotors (4.1/4.2)

Before Replacing the Rotors

- Clean the brake.



Please observe the section "Cleaning the Brake", see right column.

- Measure the rotor thickness of the new rotors (4.1/4.2). Nominal dimension = 18.5^{-0.08} mm must be given.



The brake must be load-free. Please check that it is load-free before de-installation. In order to replace the rotors (4.1/4.2), the brake must be unscrewed from the distance ring (14).

Replace the rotors by following the Brake Installation instructions backwards.

When armature disk (3) replacement is necessary, please proceed as follows:

- 1) Unscrew the shoulder screws (8) from the coil carrier (2) and remove the armature disk (3).
Attention: The thrust springs (5) press against the armature disk (3). In order to remove the shoulder screws (8), the armature disk (3) must be pressed against the coil carrier (2) to avoid immediate relaxation of the thrust springs (5). Observe the installation position of the armature disk (3), and ensure that no thrust springs (5) fall out.

CAUTION



Danger of injury.

- 2) Lay the new armature disk (3) onto the coil carrier (2) or the thrust springs (5) (observe installation position).
- 3) Press the armature disk (3) down against the spring force and screw in the shoulder screws (8) up to their limits using a tightening torque of **18.5 Nm**.

For further assembly of the brake, please follow the Brake Installation instructions, followed by Brake Inspection and Run-in Procedure, see pages 11 and 12.

Information on the Components

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

Possible hazards:

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

Classification: Hazardous property
Attention: H-classification: H372



Protective measures and rules of behavior:

Do not inhale dusts.

Vacuum the dusts at the point of origin

(tested suction devices, tested filters acc. DIN EN 60335-2-69 for dust classes H; maintenance of the suction devices and filter replacement at regular intervals).

If local dust suction is not possible or is insufficient, the entire work area must be ventilated using appropriate technology.

Additional information:

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

Cleaning the Brake



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

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

Disposal

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

Electronic Components (Rectifier / Switch):

Products which have not been disassembled can be disposed of under Code No. 160214 (mixed materials) or components under Code No. 160216, or can be disposed of by a certified disposal firm.

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

Steel scrap (Code No. 160117)

All aluminum components:

Non-ferrous metals (Code No. 160118)

Steel or aluminum pads with friction linings:

Brake linings (Code No. 160112)

Seals, O-rings, V-seals, elastomers:

Plastic (Code No. 160119)

Guidelines on the WEEE Directive 2012/19/EU

Avoidance of waste from electrical and electronic devices and the reduction of such waste through recycling.

Our electromagnetic products (brakes, clutches) as well as the components required to control them (rectifiers) are frequently used in electrical and electronic devices within the appropriate area of application of WEEE, independent of the applicable product categories.

The stated products do not fall within the area of application of this Directive. They have been classified as electromagnetic / electronic components (VDE 0580) or as electronic equipment (DIN EN 50178), and have been determined for installation in devices for "use in accordance with the intended purpose". Only products which are to be viewed as devices in terms of the Directive and not as parts or components are subject to registration obligations.

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.01 _._ Size 500

(E070 10 172 000 4 EN)

Malfunctions / Breakdowns

Malfunction	Result of Malfunction	Possible Causes	Solutions
The brake does not release completely; permanent grinding of the rotor	The axial flexibility of the rotor is limited; rotor is jammed axially	Incorrect tolerance constellation on the shaft-hub connection	Check tolerances
		Tolerance errors on the key connection	
		Broken hub due to installation error when mounting	Suitable mounting method
		Poor shaft quality	Check the shaft quality
		Poor key dimensioning	Carry out a key calculation
		Contamination of the hub or rotor tooting due to abraded or worn particles	Check the hub and rotor tooting; maintain suitable maintenance intervals
	Wear, damage, deformation or breakage of the hub and rotor tooting		
	Wiring error on the brake	Incorrect voltage; no DC voltage	Check voltage; observe the wiring guidelines
		Defective electrical wiring	Check electrical wiring
		Defective coil, coil is electrically or thermally overloaded	Check coil capacity; check insulation resistance
	Air gap too small in released condition	Due to installation	Air gap inspection
		Penetration of foreign bodies into the brake, in particular magnetisable particles	Check the brake interior for dirt and clean it
Excessive component temperatures; temperature expansion		Temperature inspection	
Increased friction work; brake grinds	Excessively long engagement times	Load accelerates the drive line during the brake engagement time	Check for correct wiring, switching times and dimensioning
	Drop in braking torque	Excessive wear on the rotor	Wear inspection; replace the rotor
	Motor starts up against closed brake	Excessive brake attraction times	Check for correct wiring, switching times; check dimensioning; check motor controls
Component breakage	Operating conditions	Oscillations, vibrations, overload, unpermittedly high speeds	Check operating conditions and dimensioning
	Ambient influences, temperature, fluids, media, corrosion	Friction linings sticking, settling or swelling; changes in friction lining friction behavior	Check protection against environmental influences
	Deviations, adjustment dimensions, screw tightening torques	Brake securement, hand release, actuation lever, screws	Check the guidelines and values according to the information in the Installation and Operational Instructions

Malfunctions / Breakdowns

Malfunction	Result of Malfunction	Possible Causes	Solutions <input type="checkbox"/> The brake must always be dismantled in order to remove damage and malfunctions. <input type="checkbox"/> Damaged parts must be replaced in order to solve the respective problem. <input type="checkbox"/> The brake must be cleaned before re-installation.
Slipping; permanent grinding of the brake under load; increase in friction work	Braking torque too low	Brake run-in procedure not carried out	Carry out a run-in procedure
		Do not carry out regular conditioning	Carry out conditioning of the friction pairing
		Incorrect dimensioning	Check the required braking torque
		Incorrect spring configuration	Check the spring configuration; have the brake checked at the place of manufacture
	Drop in braking torque	Excessive wear on the rotor	Wear inspection
		Changes to the friction behavior on the friction lining due to the maximum sliding speed being exceeded	Check for correct wiring, switching times and dimensioning
	Changes in braking torque	Unpermittedly high friction work, squeaking, type and quality of the counter friction surface	Check for correct wiring, switching times and dimensioning
		Corrosion on the counter friction surface	Check the brake for corrosion
		Ambient influences, oil, water, cleaning media, condensation formation	Check protection against environmental influences
		Type and quality of the counter friction surface	Check the counter friction surface
		Extremely low friction speeds	Check the dimensioning
	Brake cannot be released	Excessive pull-in distance due to unpermitted wear	Wear inspection; replace the rotor
		No voltage connection	Check the voltage connection



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.