

Spring applied, electromagnetic safety brake

BRE 250 ... BRE 400
Protection IP55 / IP66
(Mayr ROBA-stop[®]-M 250 ... 500)

Issue status 2019-10



Translation of the Original Operational Instructions

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Installation and Operational Instructions for BRE250 and BRE400 ROBA-stop®-M brake Type 891.0__ __ Sizes 250 and 500

(E070 09 203 001 4 EN)

Design according to

| Mayr – Size | Mayr – Type | Nord – Size | Protection |
|-------------|-------------|-------------|------------|
| 250 | 891.01_0 | BRE250 | IP54 |
| 250 | 891.01_1 | BRE250 | IP66 |
| 500 | 891.02_0 | BRE400 | IP54 |
| 500 | 891.02_1 | BRE400 | IP66 |

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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Installation and Operational Instructions for BRE250 and BRE400 ROBA-stop[®]-M brake Type 891. 0__ __. Sizes 250 and 500

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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 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 fulfil 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, Authorisation and Restriction of Chemicals. This regulates the manufacture, placing on the market and use of chemical substances in preparations, under certain conditions also pertaining to substances in products. *mayr*[®] power transmission exclusively manufactures products (articles: clutches/couplings, electric motors, brakes and the appropriate rectifiers) in accordance with the definition in Article 3 Section 3 of the REACH Regulation. In some products (ROBA-stop[®], Sizes 2 – 11, Type 8 - - - - - / ROBA-stop[®]-M, Sizes 2 – 500, Type 891. - - - - - / ROBA-stop[®]-silenzio[®], Sizes 4 – 8, Type 896. - - - - - / ROBA-topstop[®], Sizes 100 – 260, Type 899. - - - - -), shoulder screws are installed which are made from a copper alloy containing up to 2.5 % by weight lead. 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 Concerning the Classification, Labelling and Packaging of Substances and Mixtures (CLP Regulation) and are therefore not subject to the classification and labelling obligations. We would hereby 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-energised, 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 energisation of the brakes with rectifiers, phase demodulators, ROBA®-switch devices or similar controls can produce disturbance which lies above the allowed limit values. For this reason it is important to read the Installation and Operational Instructions very carefully and to keep to the EMC directives.

Application Conditions



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

- Mounting dimensions and connection dimensions must be adjusted according to the size of the brake at the place of installation.
- Use of the brake in extreme environmental conditions or outdoors, directly exposed to the weather, is not permitted.
- The brakes are designed for a relative duty cycle of 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 -4 °F and +104 °F (-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 standardised inspection of the protective conductor connections to all contactable metal parts!

Class of Insulation F (+311 °F / +155 °C)

The insulation components on the magnetic coils are manufactured at least to class of insulation F (+311 °F / +155 °C).

Protection

IP54 (Type 891.0__ __.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 891.0__ __.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 -4 °F up to +104 °F (-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): 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.

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 0.12 in (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.

Installation and Operational Instructions for BRE250 and BRE400 ROBA-stop®-M brake Type 891.0__ __ Sizes 250 and 500

(E070 09 203 001 4 EN)

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

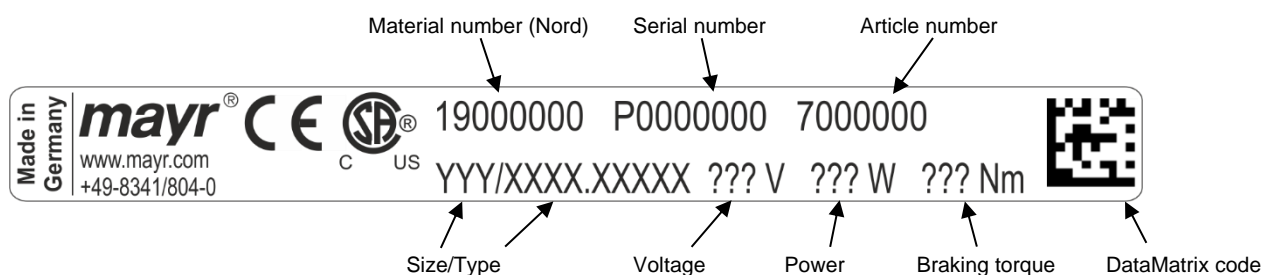
 in accordance with the Low Voltage Directive 2014/35/EU (only in case of voltages > 72 V) and / or RoHS Directive 2011/65/EU with 2015/863/EU

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 BRE250 and BRE400 ROBA-stop®-M brake Type 891.0 __ __ Sizes 250 and 500

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Brake Illustrations Size 250

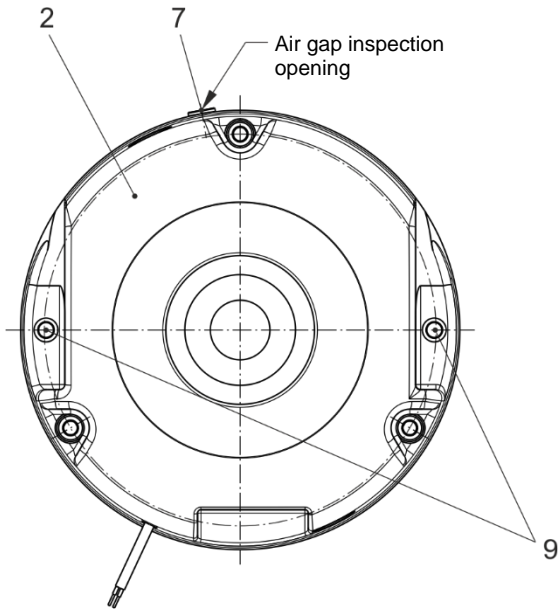


Fig. 1 (Type 891.0 __.0)

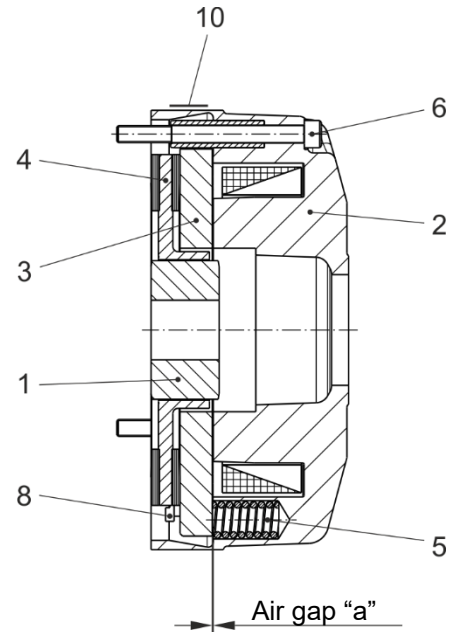


Fig. 2 (Type 891.0 __.0)

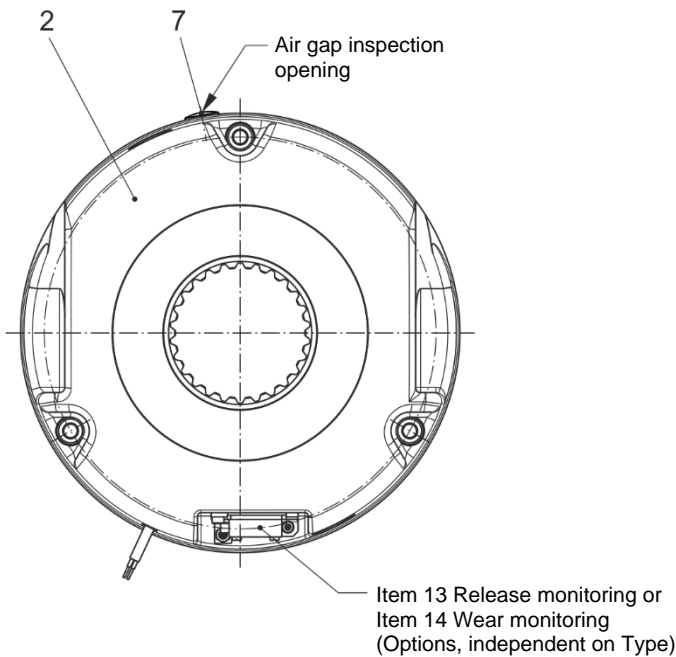


Fig. 3 (Type 891.0 __.1)

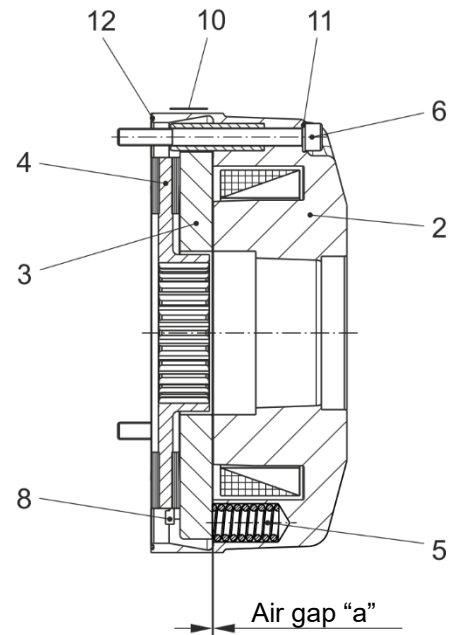


Fig. 4 (Type 891.0 __.1)

Installation and Operational Instructions for BRE250 and BRE400 ROBA-stop®-M brake Type 891.0___. Sizes 250 and 500

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Brake Illustrations Size 500

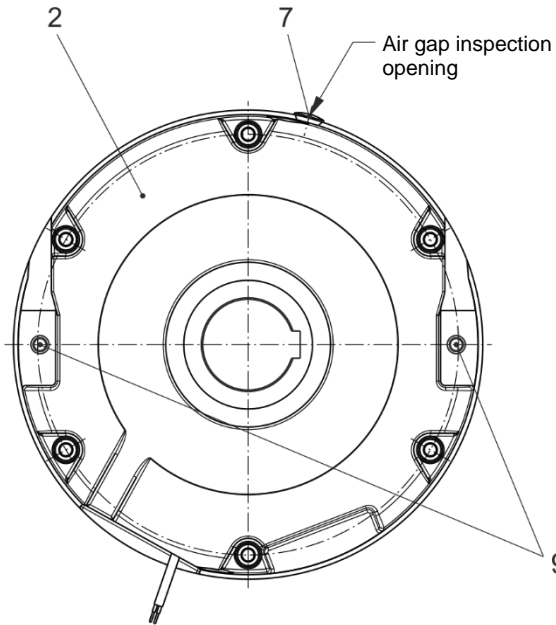


Fig. 5 (Type 891.0___.0)

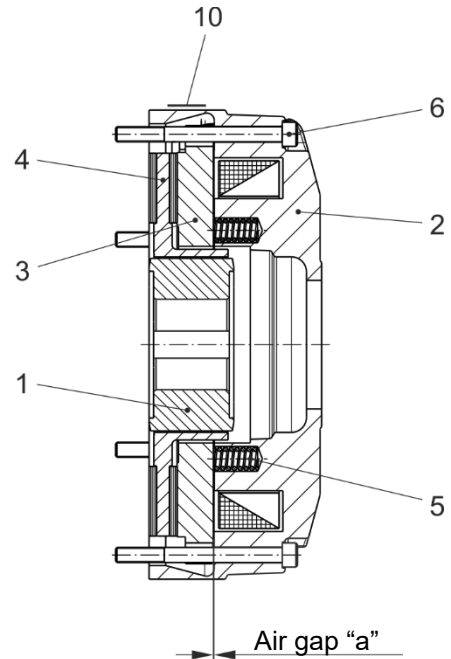
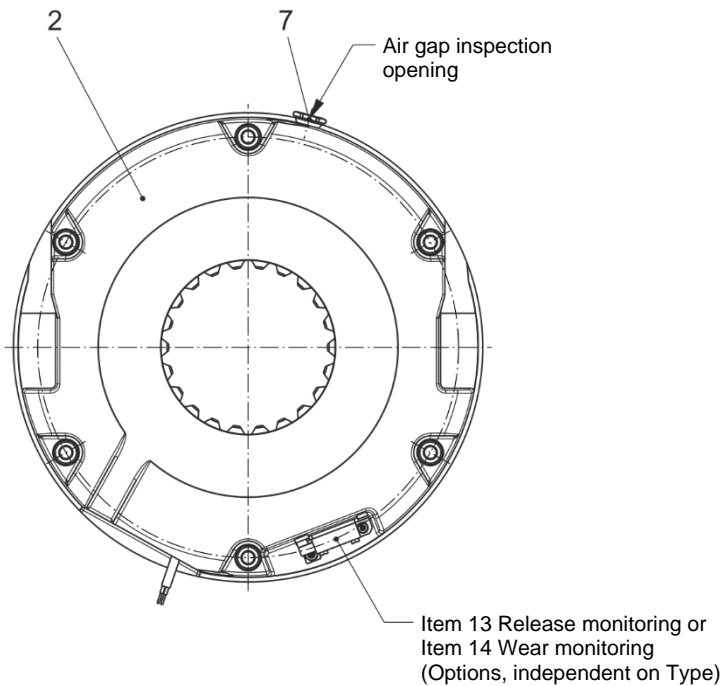


Fig. 6 (Type 891.0___.0)



337 Bild 7 (Type 891.0___.1)

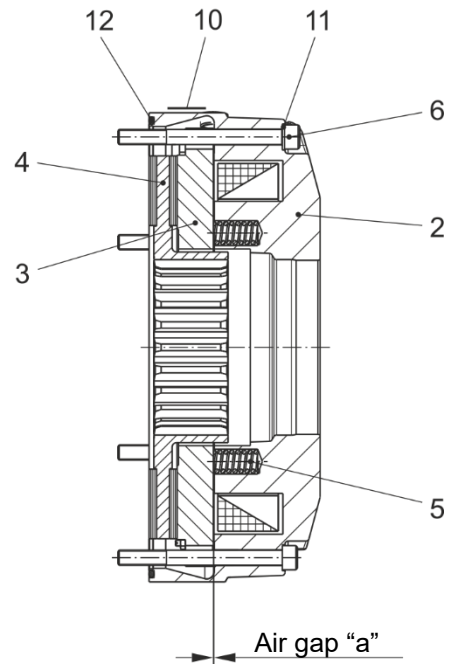


Bild 8 (Type 891.0___.1)

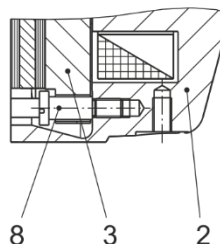


Fig. 9

Installation and Operational Instructions for BRE250 and BRE400 ROBA-stop®-M brake Type 891.0___. Sizes 250 and 500

(E070 09 203 001 4 EN)

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

| Item | Name | Pcs. | |
|------|--|--------------------------|--------------------------|
| | | Size 250 | Size 500 |
| 1 | Hub ¹⁾ | 1 | 1 |
| 2 | Coil carrier assembly (with magnetic coil) | 1 | 1 |
| 3 | Armature disk | 1 | 1 |
| 4 | Rotor | 1 | 1 |
| 5 | Thrust spring | acc. spring dimensioning | acc. spring dimensioning |
| 6 | Cap screw M10 x 110 DIN EN ISO 4762 | 3 | 6 |
| 7 | Sealing plug ²⁾ D16 / 12 x 1.5 | 1 | - |
| | Screw plug M16 x 1.5 (with O-ring) | - | 1 |
| 8 | Shoulder screw D18 x 44 | 2 | 2 |
| 9 | Cone plug (only on Type 891.0___.0) | 2 | 2 |
| 10 | Type tag | 1 | 1 |
| 11 | Bonded seal (only on Type 891.0___.1) | 3 | 6 |
| 12 | O-ring (only on Type 891.0___.1) | 1 | 1 |
| 13 | Release monitoring (option, independent on Type) | 1 | 1 |
| 14 | Wear monitoring (option, independent on Type) | 1 | 1 |

¹⁾ The hub (1) must be ordered separately.

²⁾ An additional screw plug M16 x 1.5 (with O-ring) is installed on Size 250 and Type 891.0___.1



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 BRE250 and BRE400 ROBA-stop®-M brake Type 891.0__ __ Sizes 250 and 500

(E070 09 203 001 4 EN)

Table 1: Technical Data

| Size: | 250 | 500 |
|--|--|--|
| Type: | 891.01__ __ | 891.02__ __ |
| Nominal braking torque: | 184 lbf-ft (250 Nm) | 295 lbf-ft (400 Nm) |
| Braking torque tolerance (conditioned): | +40% / -20% | +40% / -20% |
| Braking torque tolerance (without conditioning): | +40% / -30% | +40% / -30% |
| Reference speed n_{ref} : | 750 rpm | 750 rpm |
| Max. speed n_{max} (brake engagement): | 3600 rpm | 3000 rpm |
| Permitted idle speed: | 4700 rpm | 3800 rpm |
| Nominal voltage U_N : | see Type tag | see Type tag |
| Electrical power at nominal voltage P_N : | see Type tag | see Type tag |
| Electrical connection, magnetic coil: | 2 x 0.88 mm ² | 2 x 0.88 mm ² |
| Mass with cap screw, without hand release and without hub: | 57 lbm (25.9 kg) | 79 lbm (35.9 kg) |
| Weight of hub / hand release assembly / hand release bar | 2.2 lbm / 2.8 lbm / 2.8 lbm (0.98 kg / 1.27 kg / 1.28 kg) | 6.5 lbm / 5.4 lbm / 2.8 lbm 2.95 kg / 2.46 kg / 1.28 kg |
| Nominal air gap "a" (Figs. 2/4/6/8): | 0.0138 ^{+0.0039} _{-0.0020} in (0.35 ^{+0.1} _{-0.05} mm) | 0.0157 ^{+0.0079} in (0.40 ^{+0.2} mm) |
| Max. permitted air gap "a" after wear (Figs. 2/4/6/8) ¹⁾ : | 0.0374 in (0.95 mm) | 0.0394 in (1.0 mm) |
| Minimal width of the counter friction surface: | 0.55 in (14 mm) | 0.75 in (19 mm) |
| Tightening torque Item 6: | 33.2 lbf-ft (45 Nm) | 33.2 lbf-ft (45 Nm) |
| Tightening torque Item 8: | 13.6 lbf-ft (18.5 Nm) | 13.6 lbf-ft (18.5 Nm) |
| Rotor thickness "new" +0.0032 in (+0.08 mm): | 0.6693 in (17 mm) | 0.7283 in (18.5 mm) |
| Minimum rotor thickness: | 0.646 in (16.4 mm) | 0.705 in (17.9 mm) |
| Mass moment of inertia (hub + rotor): | 0,170 lbf-ft ² (71.8 x 10 ⁻⁴ kgm ²) | 0,510 lbf-ft ² (215 x 10 ⁻⁴ kgm ²) |
| Friction work $Q_{r,0.1}$ (per 0,0039 in (0.1 mm) wear): | 130 x 10 ⁶ J | 170 x 10 ⁶ J |
| Friction work $Q_{r, ges.}$ (max. possible friction work related to nominal air gap): | 780 x 10 ⁶ J | 1700 x 10 ⁶ J |
| Duty cycle: | 100 % | 100 % |
| Protection (Type 891.0__ __.0): | IP 54 / IP55 ²⁾ | IP 54 / IP55 ²⁾ |
| Protection (Type 891.0__ __.1): | IP 66 | IP 66 |
| Ambient temperature: | -4 °F to +104 °F (-20 °C to +40 °C) | -4 °F to +104 °F (-20 °C to +40 °C) |

¹⁾ Customer-side changes of the spring configuration have an effect on the maximum permitted air gap.

²⁾ 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 < 322 J/in² (< 0.5 J/mm²) and sliding speeds < 33 ft/s (< 10 m/s).

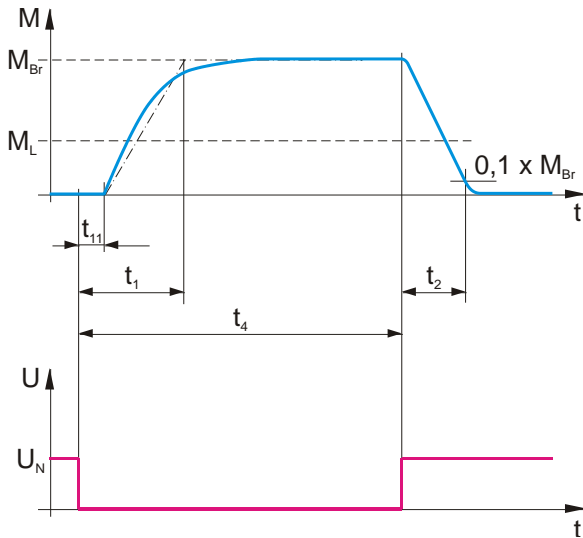
Table 2: Changes in switching time t_{11} for different spring configurations

| Size | Spring configuration | Braking torque | t_{11} |
|------|----------------------|---------------------|----------|
| 250 | 8 x D21.5 | 184 lbf-ft (250 Nm) | 100 % |
| 250 | 7 x D21.5 | 161 lbf-ft (218 Nm) | 160 % |
| 250 | 6 x D21.5 | 138 lbf-ft (187 Nm) | 220 % |
| 500 | 14 x D15 + 2 x D24.5 | 295 lbf-ft (400 Nm) | 100 % |
| 500 | 11 x D15 + 2 x D24.5 | 258 lbf-ft (350 Nm) | 137.5 % |

Installation and Operational Instructions for BRE250 and BRE400 ROBA-stop®-M brake Type 891.0__ __ Sizes 250 and 500

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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} |
| U_N | = | Coil nominal 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 8265886 for Size 250 or article number 8265888 for Size 500).

Function

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

Spring applied function (brake):

In de-energised condition, thrust springs (5) press against the armature disk (3). The rotor (4) is held between the armature disk (3) and the customer-side machine wall via frictional locking. The braking torque is introduced into the drive line via the toothing of the rotor (4) 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). The brake is released and the brake rotor (4) with the hub (1) can rotate freely.

Safety brake function:

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 891.0_1.1.

The hub (1) is not included in the standard scope of delivery and must be ordered separately.

Included loose in delivery are:

- rotor (4)
- cap screws (6)

Additional parts for Type 891.0__ __.1:

- bonded seals (11)
- O-ring (12)

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 and Operational Instructions for BRE250 and BRE400 ROBA-stop®-M brake Type 891.0__ __ Sizes 250 and 500

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Installation Conditions

- ❑ The eccentricity of the shaft end in relation to the mounting pitch circle must not exceed 0.0079 in (0.2 mm).
- ❑ The positional tolerance of the threads for the cap screws (6) must not exceed 0.0079 in (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 **0.0039 in (0.1 mm)** for Size 250 and of **0.0049 in (0.125 mm)** for Size 500, according to 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 of the rotor (4) 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 rotor (4) jamming on the hub (1) and therefore to brake malfunctions.
Recommended hub – shaft tolerance H7/k6.
The max. permitted joining temperature of 302 °F (150 °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). 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 rotor (4) and brake surfaces must be oil and grease-free.
- ❑ The toothings of the hub (1) and the rotor (4) must not be oiled or greased.
- ❑ Friction value-increasing surface treatments are not permitted.
- ❑ 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 10)

1. Mount the hub (1) 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. Measure the rotor thickness of the new rotor (4). The nominal dimension acc. Table 1 must be given.
3. Push the rotor (4) onto the hub (1) by hand (the rotor collar should be facing away from the machine wall). The rotor toothing must lie over the entire length of the hub (1). Make sure that the toothing moves easily.
Do not cause any damage!
4. If necessary (dependent on Type), insert the O-ring (12) into the axial groove of the coil carrier (2).
5. Push the rest of the brake over the hub (1) and the rotor collar (4) (the fixing holes should align with the bores in the machine wall). 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.
6. Secure the brake with the cap screws (5) and mounted seals (Item 11 / dependent on Type) onto the machine wall evenly all around **using a torque wrench and a tightening torque of 33.2 lbf-ft (45 Nm)**.
7. Check the air gap, see page 16.
8. Establish the electrical connection of the brake.

Hand Release

The brakes are suitable for the optional attachment of a hand release device.



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 machine wall and de-energised!

The hand release devices have already been mounted manufacturer-side for designs Type 891.0_1.1.

Installation and Operational Instructions for BRE250 and BRE400 ROBA-stop[®]-M brake Type 891.0__ __ Sizes 250 and 500

(E070 09 203 001 4 EN)

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 3.3 ft/s (1 m/s) and 33 ft/s (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 motor Type tag.

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:

Approx. Please carry out approx. 5 dynamic braking procedures

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

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 (10).

→ Inspect the air gaps:

Air gap "a" (brake de-energised):
The nominal air gap acc. Table 1 must be given.

→ Release function inspection:

by energising 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 BRE250 and BRE400 ROBA-stop®-M brake Type 891.0 __ __. Sizes 250 and 500

(E070 09 203 001 4 EN)

Electrical Connection and Wiring

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). Operation can take place with alternating voltage using a rectifier or another suitable DC power supply. 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 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).

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.

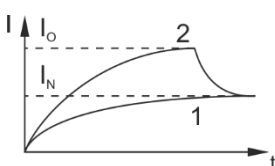
Field build-up with normal excitation

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

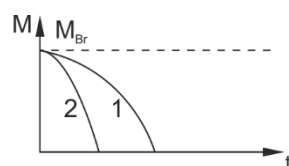
Field build-up with overexcitation

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

Current path

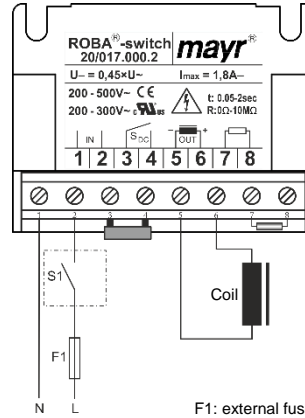


Braking torque path



Magnetic Field Removal

AC-side switching

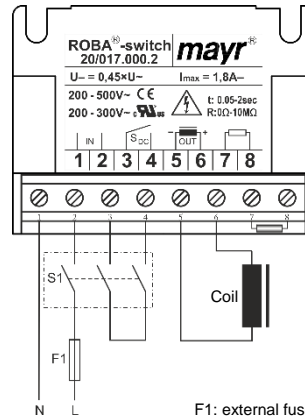


The power circuit is interrupted in front of the rectifier. The magnetic field slowly reduces. This delays the rise in braking torque.

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 0.12 in (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.

Installation and Operational Instructions for BRE250 and BRE400 ROBA-stop®-M brake Type 891.0 __ __ Sizes 250 and 500

(E070 09 203 001 4 EN)

Permitted Brake Friction Work

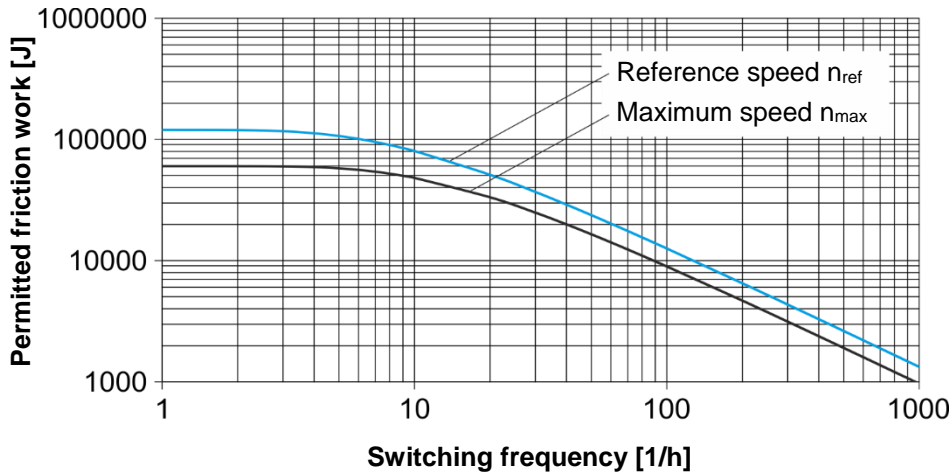
The permitted friction work values dependent on the switching frequency shown in the characteristic curve must not be exceeded, not even in EMERGENCY STOP operation.

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

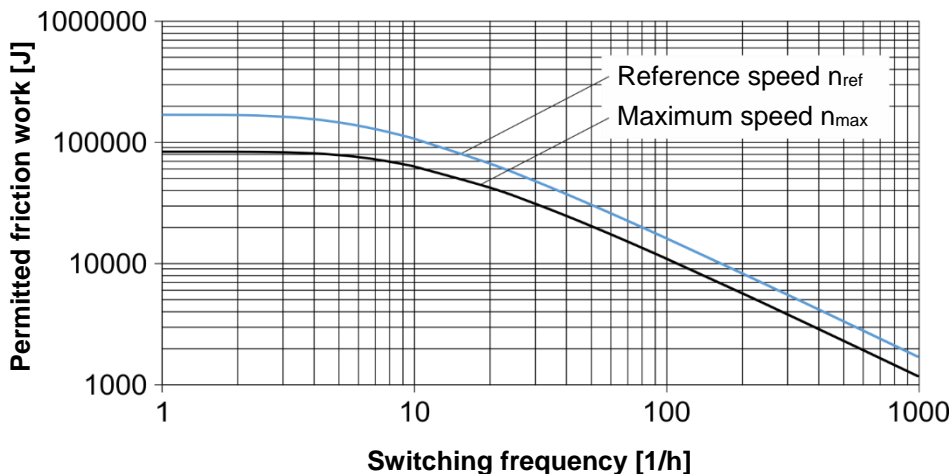


For 60 Hz operation, the max. permitted friction work values must be reduced to 70 %.

Friction power diagram for RSM 250 – BRE 250



Friction power diagram for RSM 500 – BRE 400



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
- $Q_{n\text{ ref}}$ = Permitted friction work from friction power diagram for reference speed
- $Q_{n\text{ max}}$ = 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)

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

Installation and Operational Instructions for BRE250 and BRE400 ROBA-stop®-M brake Type 891.0 __ __ Sizes 250 and 500

(E070 09 203 001 4 EN)

Optional microswitch for brake monitoring (Items 13/14 / Figs. 3 and 7)



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 13)

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".

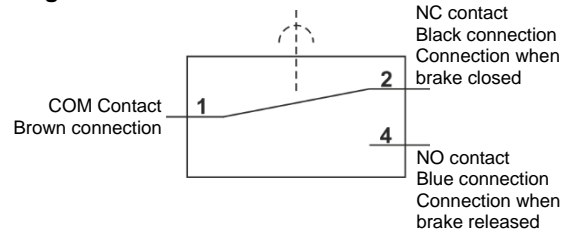
The customer is responsible for a signal evaluation of both conditions.

From the point at which the brake is energised, 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 energised 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-energised**: Inspection lamp must signal "OFF".
- Brake **energised**: Inspection lamp must signal "ON".

for connection as NC contact:

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

Wear Monitoring (Item 14)

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

Function

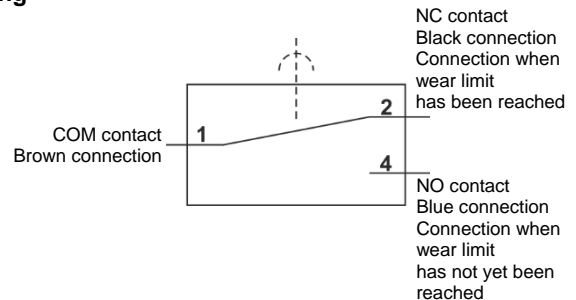
Due to wear on the rotor (4), the air gap "a" between the coil carrier (2) and the armature disk (3) increases. Once the limit air gap of **0.037 in (0.95 mm) for Size 250** or **0.039 in (1.0 mm) for size 500** has been reached, the microswitch contact switches over and emits a signal. The rotor (4) 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



Installation and Operational Instructions for BRE250 and BRE400 ROBA-stop®-M brake Type 891.0 __ __ Sizes 250 and 500

(E070 09 203 001 4 EN)

Air Gap Inspection

The air gap can be inspected via a feeler gauge after removing the sealing plug / screw plug (7). The feeler gauge must be inserted at least 1.5 in (40 mm) deep (see Fig. 10), so that the distance between the armature disk (3) and the coil carrier (2) can be measured.

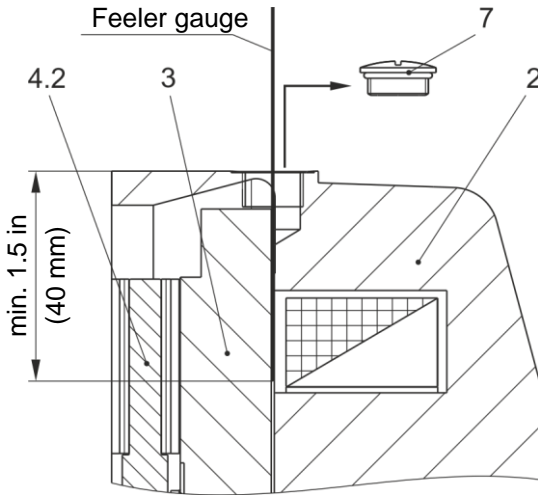


Fig. 10

Maintenance

The amount of wear on the rotor (4) must be examined during the regular inspection intervals:

ROBA-stop®-M brakes are mainly 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 rotor (4) does 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 rotor.

The quality of the counter friction surface must be checked.

The wear condition of the rotor (4) can be specified by:

- Checking the air gap (see above).
Max. permitted air gap see Table 1.
- Measuring the rotor thickness on the dismantled brake.
See Table 1 for the minimum rotor thickness.

We recommend the following regular inspection intervals:

Once a year

- Inspection of the air gap "a".

Twice a year or after 1000 operating hours

- Inspection of the rotor thickness (wear).
- Inspection of the toothing of the rotor (4) and hub (1) for ease of movement, increased backlash, and damage.
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

User-implemented determination

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 BRE250 and BRE400 ROBA-stop®-M brake Type 891.0 __ __ Sizes 250 and 500

(E070 09 203 001 4 EN)

Replacing the Rotor (4)

Before replacing the rotor (4)

- Clean the brake.



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

- Measure the rotor thickness of the new rotor (4).
The nominal dimension acc. Table 1 must be given.



DANGER The brake must be load-free. Please check that it is load-free before de-installation. In order to replace the rotor (4), the brake must be unscrewed from the machine wall.

Replace the rotor 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 **13.6 lbf-ft (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 12 and 13.

Information on the Components

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

Possible hazards:

No potential dangers have been recognised so far when the brake is used according to its intended purpose. When grinding in the 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 behaviour:

Do not inhale dusts.

Vacuum the dusts at the point of origin

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

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

Additional information:

This friction lining (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 aluminium components

Non-ferrous metals (Code No. 160118)

Steel or aluminium 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 BRE250 and BRE400 ROBA-stop®-M brake Type 891.0 __ __.

Sizes 250 and 500

(E070 09 203 001 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 behaviour | 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 |

Installation and Operational Instructions for BRE250 and BRE400 ROBA-stop®-M brake Type 891.0__ __. Sizes 250 and 500

(E070 09 203 001 4 EN)

Malfunctions / Breakdowns

| Malfunction | Result of Malfunction | Possible Causes | Solutions |
|---|------------------------------|--|--|
| Slipping; permanent grinding of the brake under load; increase in friction work | Too low Braking torque | 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 behaviour 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.

Local support

For local support follow
<https://www.mayr.com/en/company/our-locations>
or use QR-Code

