Installation and Operational Instructions for ROBA-stop® Brake Type 800.45_._ Size 2

B.1110.7.GB

Please read the Operational Instructions carefully and follow them accordingly!
Ignoring these Instructions may lead to malfunctions or to brake failure, resulting in damage to other parts.

Contents:

Manufacturer's Declaration

This product is intended for installation in a machine or system, based on the machine directive 98/37/EC.
It is forbidden to start use of the product until the machine or system into which it should be built is operating in accordance with the EC directives.

The product corresponds to the low voltage directive 73/23/EEC.

The customer is responsible for compliance with the EMC directive 89/336/EEC.

Safety and Guideline Signs

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

Please Observe!
Guidelines on important points.

Chr. Mayr GmbH + Co. KG
Eichenstraße 1
87665 Mauerstetten
Germany

Tel.: 08341 / 804-0
Fax: 08341 / 804-421
http://www.mayr.de
eMail: info@mayr.de

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Safety Regulations

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

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

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

Danger!

This warning applies if:

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

Warning!
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.
The electromagnetic brakes have been developed in accordance with the latest technology regulations and are, at the point of delivery, operationally safe.

Warning:
Without a conformity inspection, this product is not suitable for use in areas where there is a high danger of explosion. This statement is based on the directive 94/9/EC (ATEX directive).

Please Observe!

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

Appointed Use

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

Guidelines for Electromagnetic Compatibility (EMC)

In accordance with the EMC directives 89/336/EEC, the individual components produce no emissions. However, functional components e.g. rectifiers, phase demodulators, ROBA®-switch devices or similar controls for mains-side energisation of the brakes can produce disturbance which lies above the allowed limit values.
For this reason it is important to read the Installation and Operational Instructions very carefully and to keep to the EMC directives.

Device Conditions

The catalogue values are standards which can, in certain cases, vary. When dimensioning the brakes, please remember that installation situations, brake torque fluctuations, permitted friction work, run-in behaviour and wear as well as general ambient conditions can all affect the given values. These factors should therefore be carefully assessed, and alignments made accordingly.

Please Observe!

- ❒ Mounting dimensions and connecting dimensions must be adjusted according to the size of the brake at the place of installation.
- ❒ The brakes are designed for a relative duty cycle of 100 %.
- ❒ The brakes are only designed for dry running. The torque is lost if the friction surfaces come into contact with oil, grease, water or similar substances.
- ❒ The braking torque is dependent on the present run-in condition of the brake.
- ❒ Manufacturer-side corrosion protection of the metallic surface is provided.

Protection Class I

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

Protection (Mechanical) IP 10:

Protection against large body surfaces and against large foreign bodies > 50 mm diameter. Not waterproof.

Protection (Electrical) IP 54:

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

Ambient Temperature –20 °C up to +40 °C

Warning!

At temperatures of around or under freezing point, condensation can strongly reduce the torque, or the rotors can freeze up. The user is responsible for taking appropriate countermeasures.

Thermic Class F (+155 °C)

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

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Safety Regulations

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User-implemented Protective Measures:

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

Regulations, Standards and Directives Used:

98/37/EC	Machine directive
73/23/EEC	Low voltage directive
89/336/EEC	EMC directive
DIN VDE 0580	Electromagnetic devices and components, general directives

Please Observe the Following Standards:

DIN EN ISO 12100-1 and 2	Machine safety
DIN EN61000-6-4	Noise emission
DIN EN61000-6-2	Interference immunity
EN60204	Electrical machine equipment

Liability

- The information, guidelines and technical data in these documents were up to date at the time of printing.
  Demands on previously delivered brakes are not valid.
- Liability for damage and operational malfunctions will not be taken if
  - the Installation and Operational Instructions are ignored or neglected.
  - the brakes are used inappropriately.
  - the brakes are modified.
  - the brakes are worked on unprofessionally.
  - the brakes are handled or operated incorrectly.

Guarantee

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

Conformity Markings

The product conforms to the CE according to the low voltage directives 73/23/EEC.

Identification

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

Manufacturer

***mayr*®**

Product name / Type

Article number

Serial number

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Germany

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eMail: info@mayr.de

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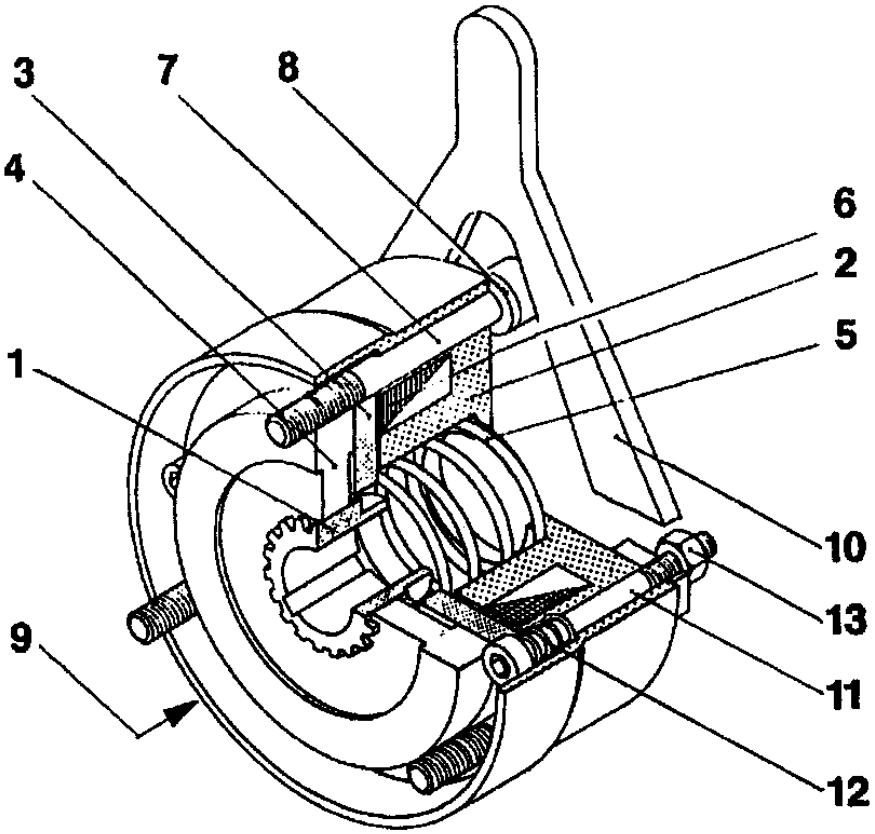

Fig. 1

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

Item	Name	Number
1	Toothed hub	1
2	Coil carrier assembly with coil (6)	1
3	Armature disk	1
4	Rotor	1
5	Thrust spring	1
6	Magnetic coil	1
7	Cap screw M4	3
8	Spring ring	3
9	Shoulder screw	2
10	Hand release bracket	1
11	Cap screw M3	2
12	Thrust spring	2
13	Hexagon nut M3	2

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Technical Data:

Braking torque:	1.1 Nm
Max. speed:	7000 rpm
Protection (mechanical):	IP 10
Protection (electrical):	IP 54
Ambient temperature:	-20 °C up to +40 °C
Mass:	0.4 kg
Rotor thickness in new condition:	$6\ ^{}_{-0.05}$ mm
Min. rotor thickness:	5.75 mm

Design

ROBA-stop® brake devices are spring applied electromagnetic safety brakes, which apply a defined braking effect after the voltage is switched off or after a voltage failure.
In order to achieve small installation dimensions, there is no wear adjustment function on this device. The braking force is produced by a central spring.
The hand release makes mechanical brake release possible. If there is no suitable customer-side counter friction flange available for the rotor, our flange plate provides a suitable alternative.

Function

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

Spring applied function (brakes):
When the brake is de-energised, the torque is produced using the force of the thrust spring (5) via frictional locking between the rotor (4), the armature disk (3) and a customer flange.
The brake is released electromagnetically.
The braking torque is conducted to the drive line via the rotor toothing (4) and the hub (1).

Electromagnetic function (release):
Due to the magnetic force of the coil (2) in the coil carrier, the armature disk (3) is attracted against the spring pressure to the coil carrier (2).
The brake is released and the rotor (4) with the hub (1) can rotate freely.

As an alternative, the device can also be released mechanically using a hand release, dependent on Type.
Release direction only away from coil carrier!

Safety brake function:
The ROBA-stop® brake device brakes safely and reliably in the event of a power switch-off, a power failure or an emergency OFF.

State of Delivery

The brake is delivered partly assembled.
Loose in delivery:
Hub (1), rotor (4), cap screws (7) and spring rings (8).
Please check the state of delivery immediately!
mayr® will take no responsibility for belatedly returned goods.
Please report transport damage immediately to the deliverer.
Please report incomplete delivery and obvious defects to the manufacturer.

Installation Conditions

- ❑ The eccentricity of the shaft end in relation to the mounting holes may not exceed 0.2 mm.
- ❑ The position tolerance of the tapped holes for the fixing screws on the customer flange may not exceed 0.2 mm.
- ❑ The axial run-out deviation of the screw-on surface to the shaft may not exceed the permitted axial run-out tolerance of **0.08 mm** according to DIN 42955. Larger deviations can lead to a drop in torque, to continuous slipping on the rotor (4) and to overheating**.**
- ❑ The hub (1) and shaft bore tolerances are to be selected so that the hub toothing (1) is not widened. Tooth widening leads to the rotor (4) jamming on the hub (1) and therefore to brake malfunctions.
  Recommended hub – shaft tolerance H7/k6.
  The maximum permitted join temperature of 200 °C mu st not be exceeded.
- ❑ The rotor (4) and the brake surfaces must be oil and grease-free.

Brake Installation (Fig. 1)

1. Mount the hub (1) with the shoulder pointing backwards (Fig. 1) onto the shaft, bring it into the correct position and secure it axially (e.g. using a locking ring).
   The entire length of the key should lie over the hub.
2. Push the rotor (4) by hand onto the hub (1).
   Make sure that the toothing runs freely.
   Do not cause damage.
   The entire length of the rotor toothing must lie over the hub (1).
3. Screw the brake onto the customer flange evenly all round using 3 cap screws (7) and spring rings (8) to **tightening torque 3 Nm**.

The shoulder screws (Item 9 / Fig. 1) prevent the individual parts from falling apart. They do not affect the brake function and must not be removed during installation.

Brake Inspection **(before initial operation of the brake)**

- **Inspection braking torque:**
  Please compare the requested braking torque with the torque stated on the Type tag
- **Release inspection:**
  Carry out by energising the brake or by operating the hand release (dependent on Type).

Full braking torque is not reached until the run-in procedure has been completed.
The braking torque (switching torque) is the torque acting on the shaft train when the brakes slip at a sliding speed of 1m/s in relation to the mean friction radius (according to DIN VDE 0580/07.2000).

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Electrical Connection

DC current is necessary for the operation of the brake.
The coil voltage is indicated on the Type tag as well as on the brake body and is designed according to the DIN IEC 60038 (± 10 % tolerance). The device can be operated both via AC voltage in connection with a rectifier or with another suitable DC supply. Dependent on the brake equipment, the connection possibilities can vary. Please follow the exact connections according to the wiring diagram. The manufacturer and the user must observe the applicable directives and standards (e. g. DIN EN 60204-1 and DIN VDE 0580). Their observance must be guaranteed and double-checked!

Earthing Connection

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

Device Fuses

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

Switching Behaviour

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

Magnetic Field Build-up

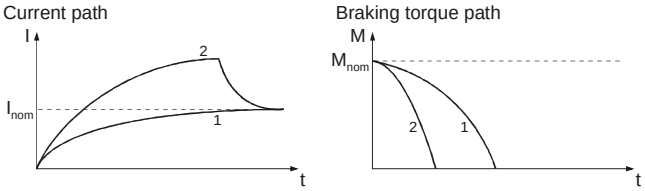
When the voltage is switched on, a magnetic field is built up in the brake coil, which attracts the armature disk to the coil carrier and releases the brake.

Field Build-up with Normal Excitation

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

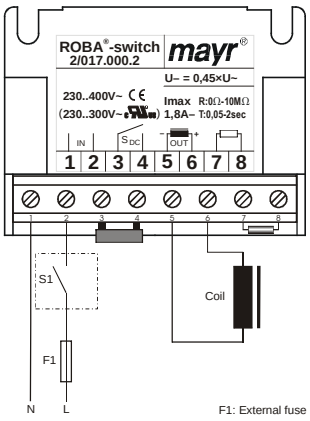
Field Build-up with Overexcitation

A quicker and safer drop in braking torque is achieved if the coil is temporarily placed under a higher voltage than the nominal voltage, as the current then increases more quickly. Once the brake is released, it is possible to switch to the nominal voltage (curve 2). The relationship between the overexcitation and the switching time is roughly proportional at up to four times the nominal voltage: this means that at doubled nominal voltage, the switching time for brake release is halved. However, the RMS power may not be larger than the coil nominal power.
The ROBA®-switch works on this principle, which is required for safe operation of this brake.



Magnetic Field Removal

AC-side switching

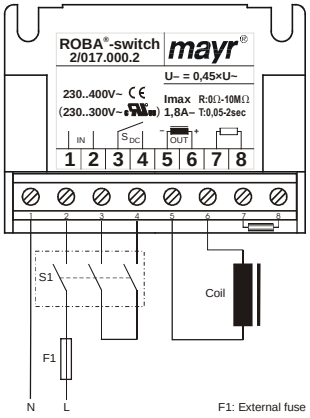


The power circuit is interrupted before the rectifier. The magnetic field slowly reduces. This delays the rise in braking torque.

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

→ **low-noise switching**, however, the brake engagement time is longer (c. 6 – 10 times longer than with DC-side switch-off). 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 is removed very quickly, resulting in a rapid rise in braking torque.

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

→ **short brake engagement time (e.g. for emergency OFF operation).** However, this produces louder switching noises.

Protective Circuit

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

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Maintenance

ROBA-stop® brakes are mainly maintenance-free.
Although rotors are of course subject to frictional wear, our rotor (4) is robust and wear-resistant, leading to a particularly high brake lifetime.
However, if the rotor (4) does become worn by high total friction work, and the function of the brake can no longer be guaranteed, it is possible, by replacing the rotor, to bring the brake back into its original condition.
While replacing the rotor, please check the quality of the counter friction surface.
To inspect the wear condition, please measure the release voltage or the rotor thickness on a dismantled brake according to the „Technical Data“ section.
The release voltage on a warm brake must not be more than max. 90 % of the nominal voltage.

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

At least half-yearly or at the latest after 100 operational hours.

The inspection should include:

- ❑ Examination of the rotor thickness (wear).
- ❑ Examination of the rotor toothing (4) and the hub (1) for smooth movement, higher play and damage.
- ❑ Inspection of the armature disk (3) and the customer-side flange friction surface for plan parallelism and wear. (excessive groove formation).
- ❑ Clean the brake.

Wear times are influenced by many different factors and can be very different. The inspection and maintenance intervals necessary must be calculated individually according to the system manufacturer’s engineering instructions.

Hand Release Installation (Figs. 1 and 2)

Installation and hand release adjustment must take place in a de-energised condition. For installation, the brake must be dismantled.

1. Remove the plastic plugs from the bores on the rear side of the brake.
2. Push the thrust springs (12) onto the cap screws (11).
3. Push both cap screws (11) through the counterbores in the armature disk (3) and through the bores in the coil carrier (2).
4. Screw the hand release bracket (10) with the hexagon nuts (13) onto the cap screws.
5. Tighten both hexagon nuts (13) until the armature disk (3) lies evenly against the coil carrier (2).
6. Turn both hexagon nuts (13) back by 1.5 turns.
   An adjustment dimension (air gap) of 0.8 mm will appear between the armature disk (3) and the coil carrier (2).

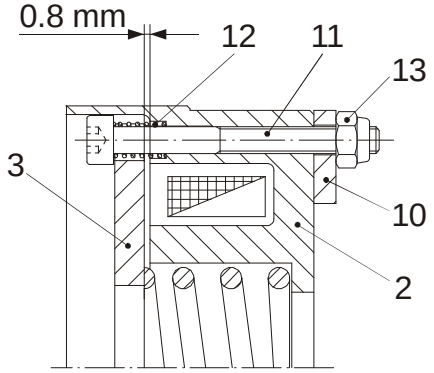

Fig. 2

Replacing Worn Parts

Wear on the rotor (4) increases the air gap "a" between the armature disk (3) and the coil carrier (2).
At regular intervals (see Maintenance), the rotor (4) is dismantled and its breadth is measured. At a breadth of 5.75 mm, the rotor (4) must be replaced. In new condition, the rotor breadth is 6.0 mm, see Fig. 3.
In order to replace the rotor (4), the brake must be screwed off the customer flange.

1. Please remove the cap screws (7) and the spring rings (8).
2. Remove the brake and remove abraded particles with compressed air (wear a dust mask and provide an industrial vacuum cleaner).
3. Pull the rotor (4) off the hub (1).
4. Inspect the armature disk (3) for wear and plan parallelism (there should be no excessive groove formation) and. If necessary, replace the armature disk.
5. To do this, the shoulder screws (9) must be removed.
   Push the armature disk (3) down against the spring force. Screw the shoulder screws (9) out of the coil carrier (2) and take off the armature disk (3).
   Observe the armature disk (3) installation position.
6. Lay the new armature disk (3) onto the coil carrier (2) or the thrust spring (5) (observe installation position). Press the armature disk (3) down against the spring force and screw in the shoulder screws (9) to tightening torque 0.5 Nm again.
7. For further procedure information, see section "Brake Installation" on page 5.

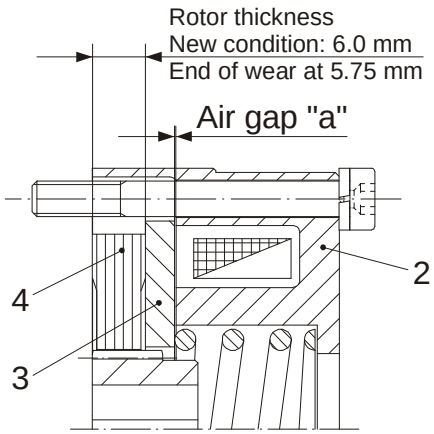

Fig. 3

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Eichenstraße 1
87665 Mauerstetten
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Disposal

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

Electronic components
(Rectifier / ROBA®-switch / Microswitch):

Products which have not been dismantled can be disposed of under the Code No. 160214 (Mixed Materials) or Components under Code No. 160216; or the objects can be disposed of by a certified waste disposal firm.

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

Brake rotors (steel or aluminium girders with friction linings):
Brake linings (Code No. 160112)

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

Malfunctions / Breakdowns:

Malfunction	Possible Causes	Solutions
Brake does not release	❑ Incorrect voltage on rectifier	❑ Apply correct voltage
	❑ Rectifier failure	❑ Replace rectifier
	❑ Air gap too large (worn rotor)	❑ Replace rotor
	❑ Metal particles between the armature disk and the coil carrier	❑ Clean brake
	❑ Coil interruption	❑ Replace brake
	❑ Brake overheating	❑ Use fast acting rectifier
Motor does not brake	❑ Worn rotor	❑ Replace rotor
Delayed brake engagement	❑ Brake is switched AC-side	❑ Switch DC-side

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