your reliable partner

Spring applied, electromagnetic safety brake

BRE 5 ... 150 Protection IP54 (IP55)
BRE 250 ... 400 Protection IP54 (IP55) / IP66
(Mayr ROBA-stop®-M 4 ... 500)

Issue status 2024-09

Translation of the Original Operational Instructions

Part 1 (General)

Design according to

Mayr – Size	Mayr – Type	Nord – Size	Protection	Application
4	891.280.4	BRE 5	IP54	Dynamic brake
4	891.500.4	BRE 5	IP54	Holding brake
8	891.280.4	BRE 10	IP54	Dynamic brake
8	891.500.4	BRE10	IP54	Holding brake
16	891.280.4	BRE 20	IP54	Dynamic brake
16	891.500.4	BRE 20	IP54	Holding brake
32	891.280.0	BRE 40	IP54	Dynamic brake
32	891.100.0	BRE 40	IP54	Holding brake
60	891.100.0	BRE 60	IP54	Dynamic brake
60	891.100.0	BRE 60	IP54	Holding brake
100	891.010.0	BRE 100	IP54	Dynamic brake
100	891.100.0	BRE 100	IP54	Holding brake
150	891.010.0	BRE 150	IP54	Dynamic brake
150	891.100.0	BRE 150	IP54	Holding brake
250	891.01_.0	BRE 250	IP54	Dynamic brake
250	891.01_.1	BRE 250	IP66	Dynamic brake
250	891.10_.0	BRE 250	IP54	Holding brake
250	891.10_.1	BRE 250	IP66	Holding brake
500	891.02_.0	BRE 400	IP54	Dynamic brake
500	891.02_.1	BRE 400	IP66	Dynamic brake
500	891.10_.0	BRE 400	IP54	Holding brake
500	891.10_.1	BRE 400	IP66	Holding brake

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Installation and Operational Instructions for BRE 5 to 400 ROBA-stop®-M Brake Type 891._ _ _._ Sizes 4 to 500

(E070 02 167 001 4 EN)

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.

Contents:

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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 EU Directives

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.

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Guidelines on UK Directives / Conformity

Products / components from *mayr*® power transmission fulfill the requirements for the British economic area due to currently identical UK and EU directives.
In addition to the CE identification, the UKCA identification is attached to the product.
The UK Declaration of Conformity is available in a separate document.

Directives under EU Law	Directives under UK Law
Machinery Directive 2006/42/EC	Supply of Machinery (Safety) Regulations UK 2008 No. 1597
EMC Directive 2014/30/EU	Electromagnetic Compatibility Regulations UK 2016 No. 1091
EU Low Voltage Directive 2014/35/EU	Electrical Equipment (Safety) Regulations UK 2016 No. 1101
RoHS II 2011/65/EU	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations UK 2012 No. 3032

Guidelines on EU and UK REACH

According to the European Union (Withdrawal) Act 2018, the EU REACH Regulation was transposed into UK law on January 1, 2021, and is known as UK REACH.
REACH and related legislation have been replicated in the UK with the necessary changes to make it workable in a domestic context.
The fundamental principles of the EU REACH Regulation have been retained in UK REACH.
The remarks on the information obligation according to UK-REACH correspond in content to the REACH Regulation (EC) No. 1907/2006.

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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.

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Safety Regulations

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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 standardized 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 (Types 891._ _ _.0 and 891._ _ _.4):
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 (only Sizes 250 and 500 / 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 and +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): 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.

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Standards, Directives and Regulations Used and To Be Applied

DIN VDE 0580	Electromagnetic devices and components, general specifications
DIN EN 61140	Protection against electric shock - Common aspects for installation and equipment
DIN EN IEC 63000	Technical documentation for the assessment of electrical and electronic equipment regarding the restriction of hazardous substances
DIN EN IEC 60529	Degrees of protection provided by enclosures (IP Code)
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:

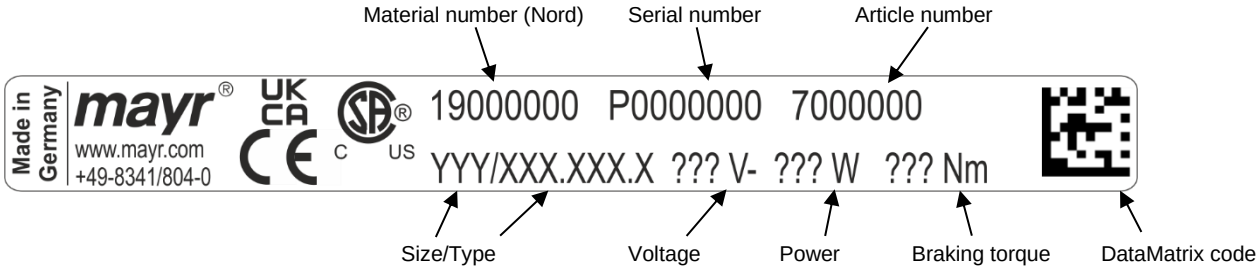
- the Installation and Operational Instructions are ignored or neglected.
- the brakes are used inappropriately.
- the brakes are modified.
- the brakes are worked on unprofessionally.
- the brakes are handled or operated incorrectly.

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!

Identification

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



CE Identification

according to the Low Voltage Directive 2014/35/EU (only for voltage DC > 75 V) and/or RoHS Directive 2011/65/EU with 2015/863/EU

UKCA Identification

according to the Low Voltage Directive UK 2016 No. 1101 (only for voltage DC > 75 V) and/or RoHS Directive UK 2012 No. 3032

Conformity Markings

in terms of the Canadian and American approval

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Table 1: Main Dimensions (Hand Release see Page 22)

mayr® – Size / Nord – Size	Ø b		d H7		Ø d4 H7		Ø D h9		Ø G		Ø M	
	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]
4 / BRE 5	30	1.811	15	0.591	-	-	87	3.425	30	1.181	72	2.835
8 / BRE 10	36	1.417	15 20	0.591 0.787	-	-	103	4.055	36	1.417	90	3.543
16 / BRE 20	42	1.654	20 25	0.787 0.984	-	-	128	5.039	33	1.299	112	4.409
32 / BRE 40	52	2.047	25 30	0.984 1.181	-	-	148	5.827	36	1.417	132	5.197
60 / BRE 60	62	2.441	25 30 35	0.984 1.181 1.378	-	-	168	6.614	38	1.496	145	5.709
100 / BRE 100	78	3.071	35	1.378	-	-	200	7.874	48	1.890	170	6.693
150 / BRE 150	84	3.307	35 45	1.378 1.772	-	-	221	8.701	55	2.165	196	7.717
250 / BRE 250	-	-	45 50	1.772 1.969	90	3.543	258	10.157	65	2.559	230	9.055
500 / BRE 400	-	-	50 60	1.969 2.362	115	4.528	310	12.205	85	3.346	278	10.945

mayr® – Size / Nord – Size	Ø R		Ø r		s	L		L1		h		H	
	[mm]	[in]	[mm]	[in]	DIN EN ISO 4762	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]
4 / BRE 5	65	2.559	45	1.772	3 x M4	38	1.469	-	-	1	0.039	14.5	0.571
8 / BRE 10	81	3.189	53	2.087	3 x M5	40.4	1.591	-	-	1	0.039	17.5	0.689
16 / BRE 20	101	3.976	68	2.677	3 x M6	45.8	1.803	-	-	1.25	0.049	26	1.024
32 / BRE 40	121	4.764	83	3.268	3 x M6	61.7	2.429	-	-	1.3	0.051	27	1.063
60 / BRE 60	129.5	5.098	94	3.701	3 x M8	72.5	2.854	-	-	1.25	0.049	26	1.024
100 / BRE 100	154	6.063	106	4.173	3 x M8	84	3.307	-	-	10	0.394	34	1.339
150 / BRE 150	178	7.008	122	4.803	3 x M8	97	3.819	-	-	7	0.276	41	1.614
250 / BRE 250	206	8.110	140	5.512	3 x M10	116	4.567	115	4.528	-	-	46	1.811
500 / BRE 400	253	9.961	160.5	6.319	3 x M10	114	4.488	113	4.449	-	-	54.5	2.146

mayr® – Size / Nord – Size	with hub bore d H7		Ø d1		l1		l	
	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]
4 / BRE 5	15	0.591	20.5	0.807	1.2	0.047	18	0.709
8 / BRE 10	20	0.787	25.6	1.008	1.5	0.059	20	0.787
	15	0.591	21	0.827	1	0.039	20	0.787
16 / BRE 20	25	0.984	32	1.260	1.5	0.059	20	0.787
	20	0.787	27	1.063	1	0.039	20	0.787

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Part 2: Sizes 4 to 150

Brake Illustrations Sizes 4 to 16 (BRE 5 to 20)

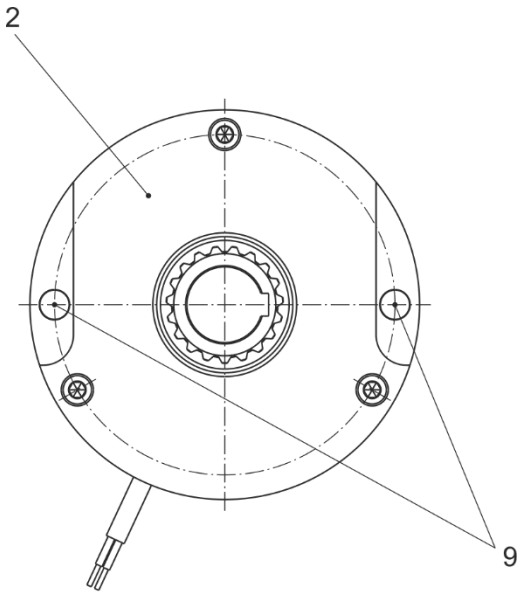

Fig. 1

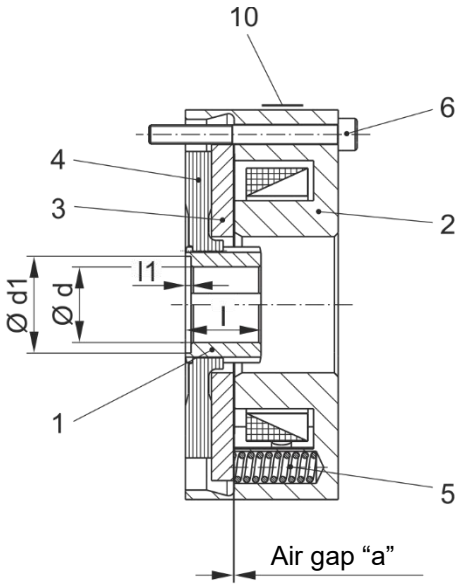

Fig. 2

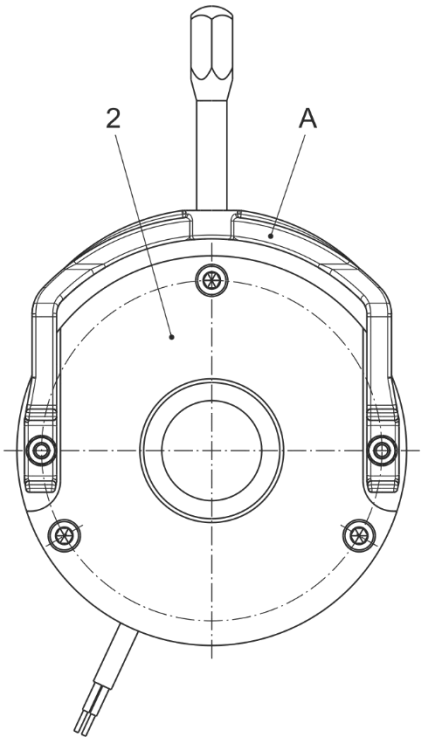

Fig. 3

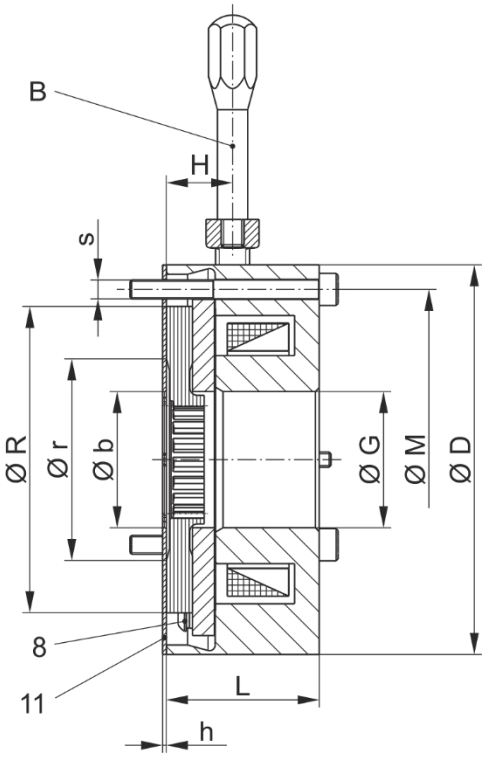

Fig. 4

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Brake Illustrations Sizes 32 and 60 (BRE 40 and 60)

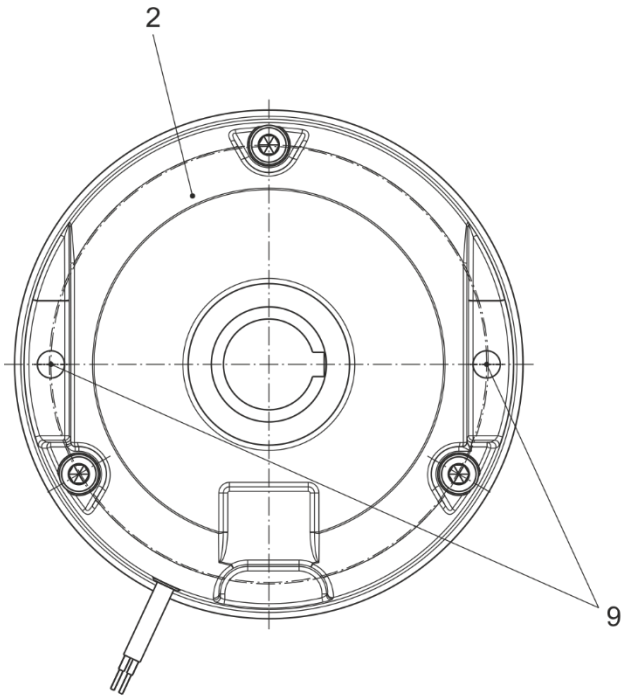

Fig. 5

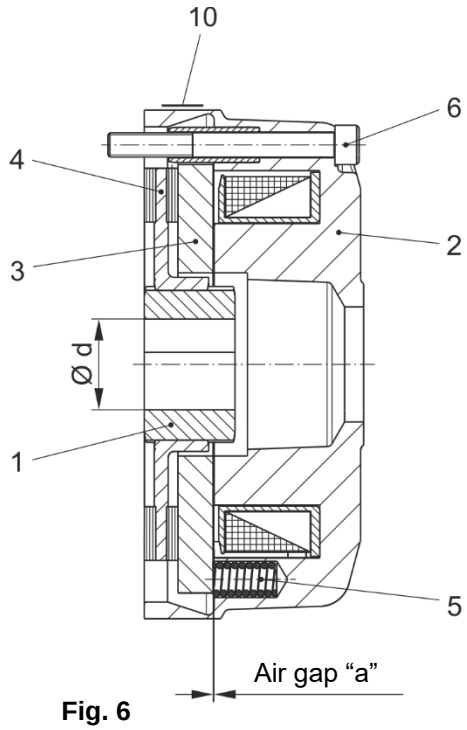

Fig. 6

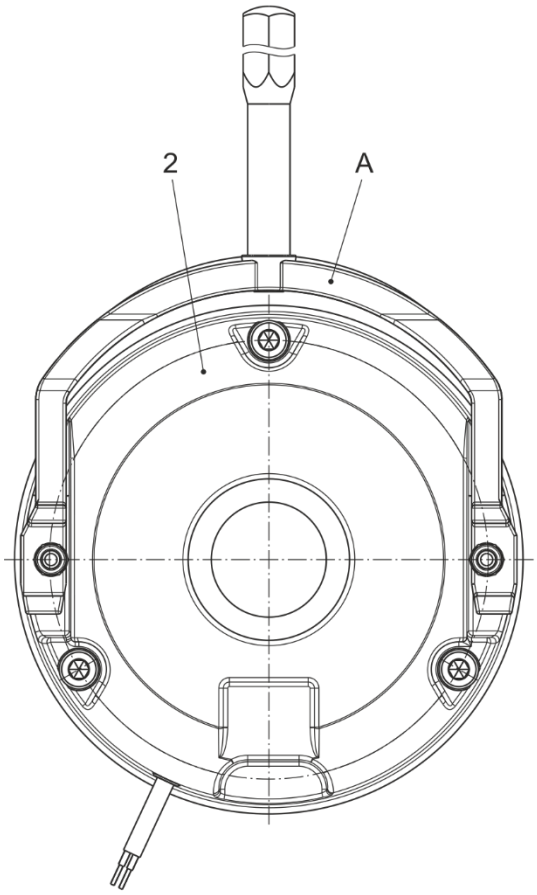

Fig. 7

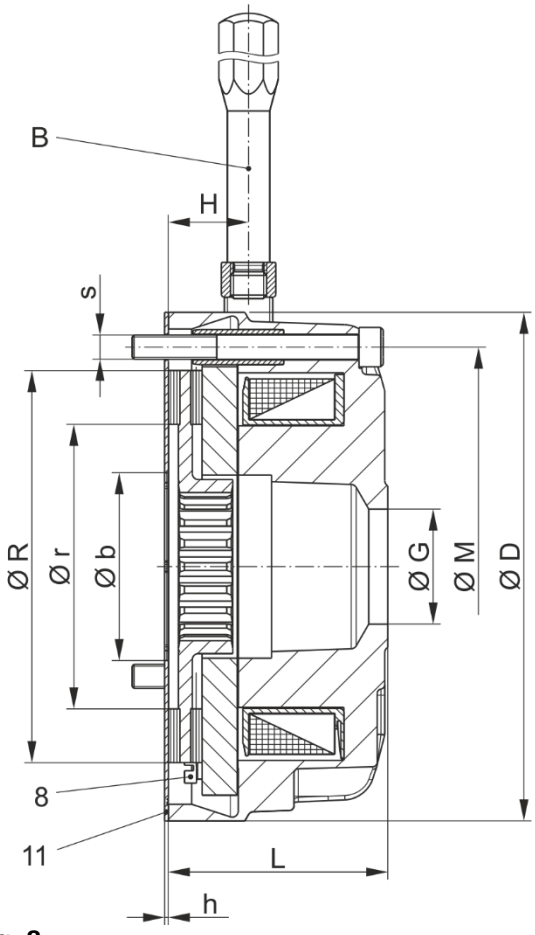

Fig. 8

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Brake Illustrations Size 100 (BRE 100)

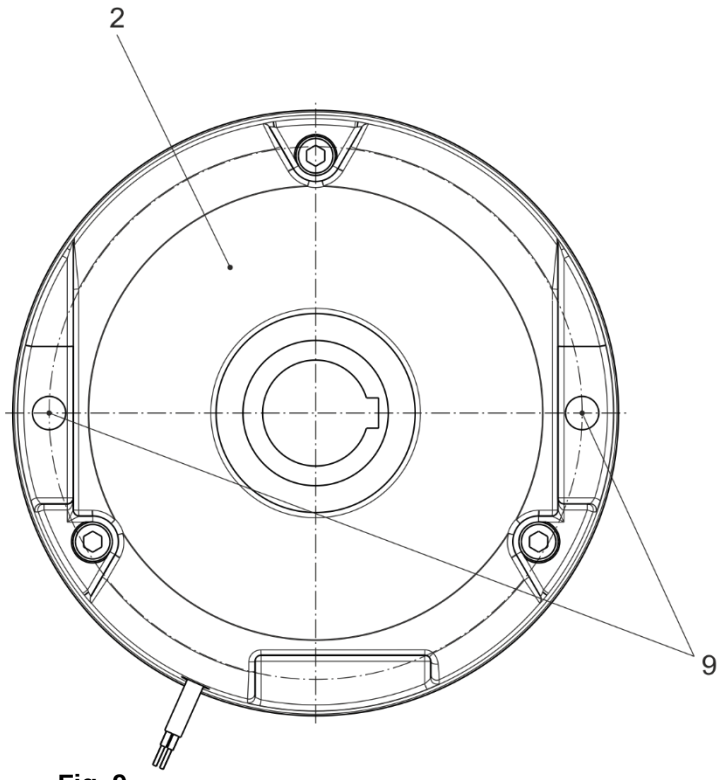

Fig. 9

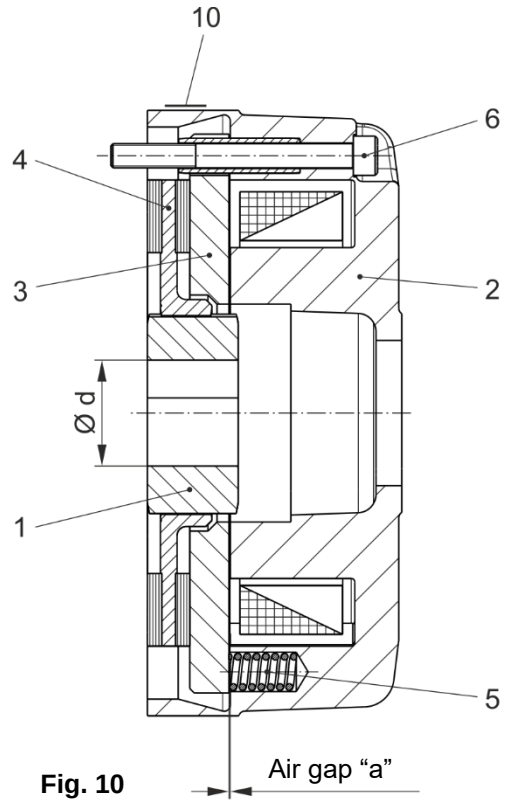

Fig. 10

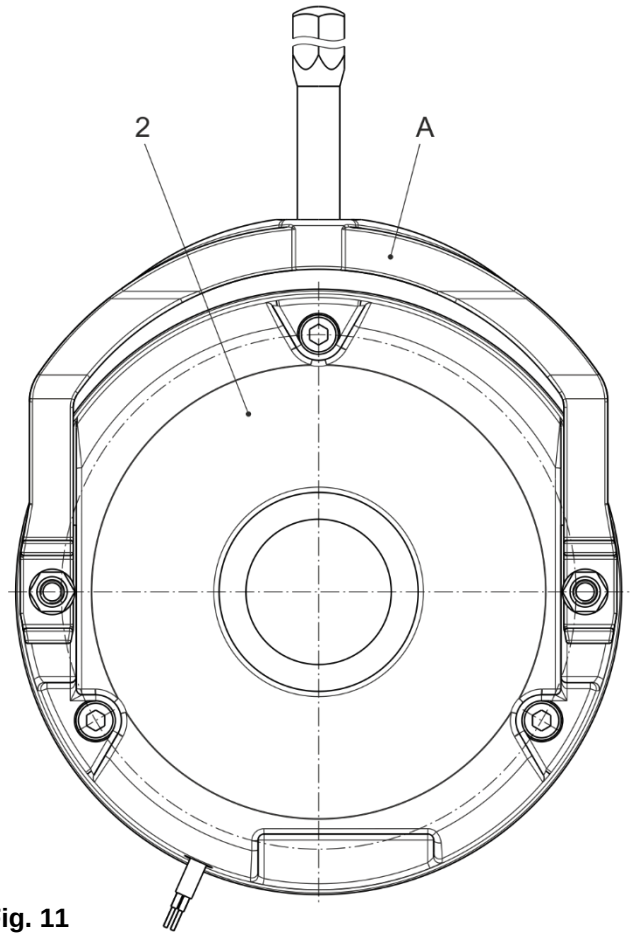

Fig. 11

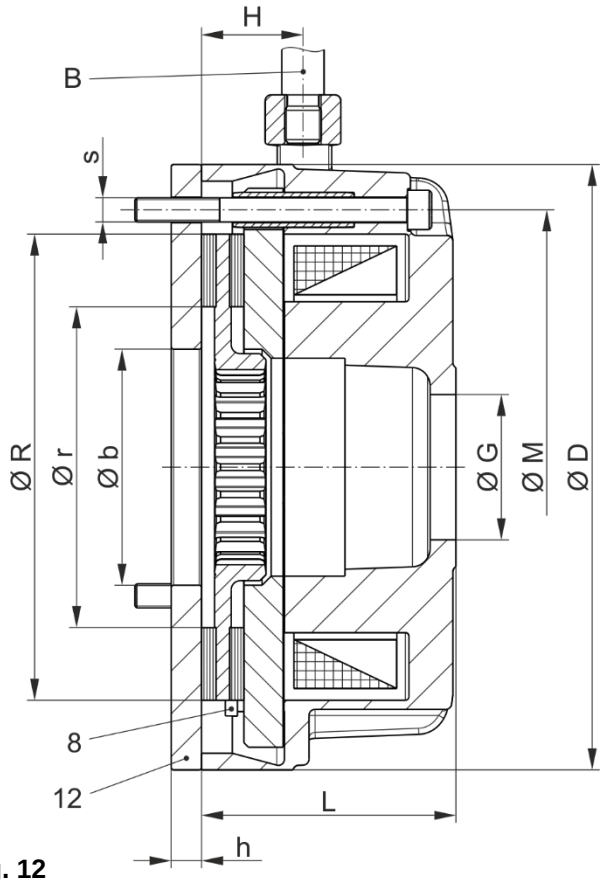

Fig. 12

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Brake Illustrations Size 150 (BRE 150)

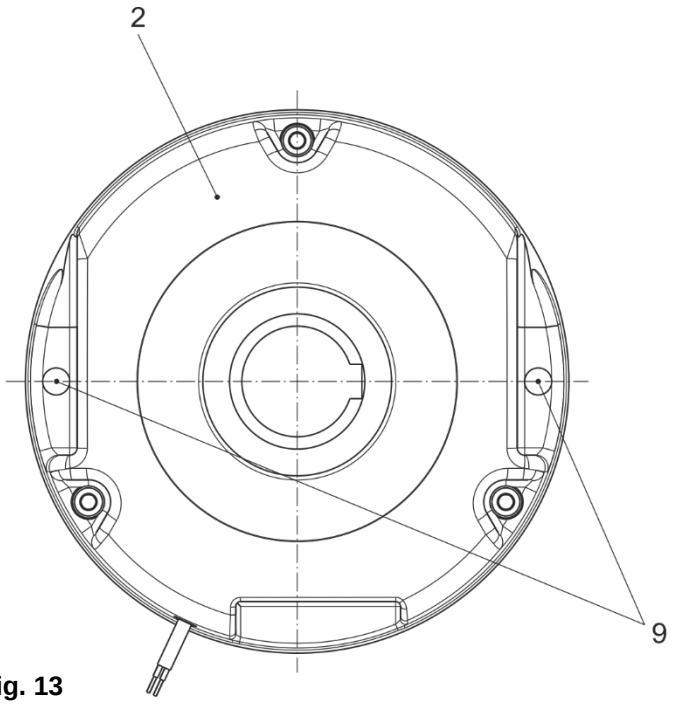

Fig. 13

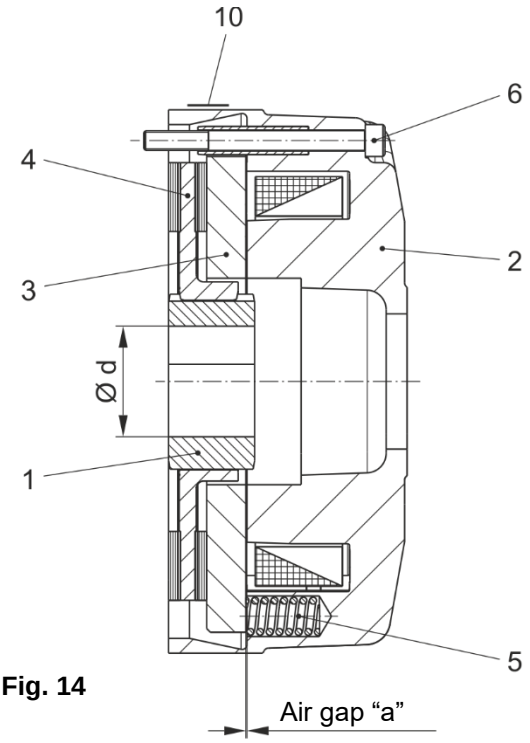

Fig. 14

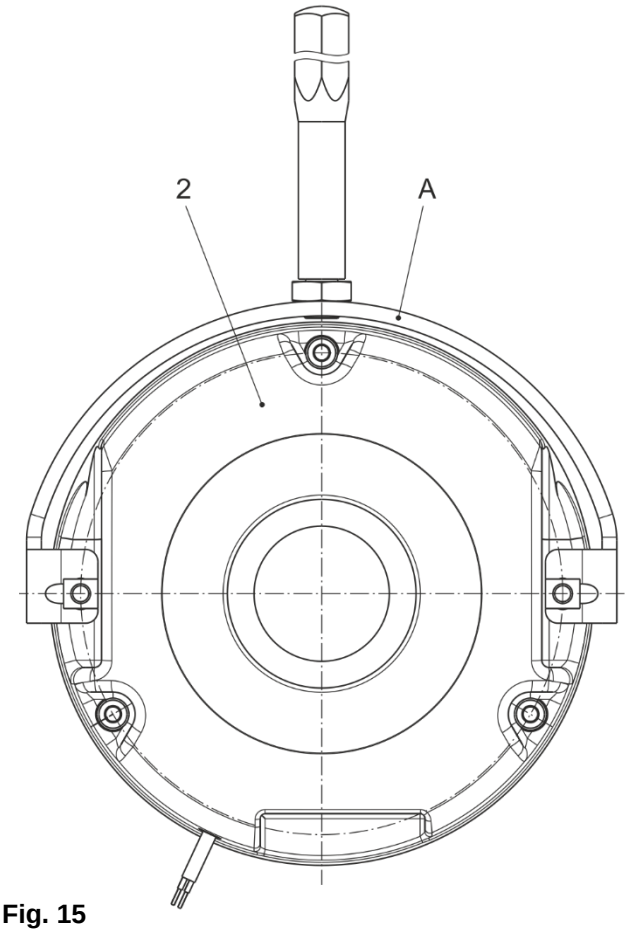

Fig. 15

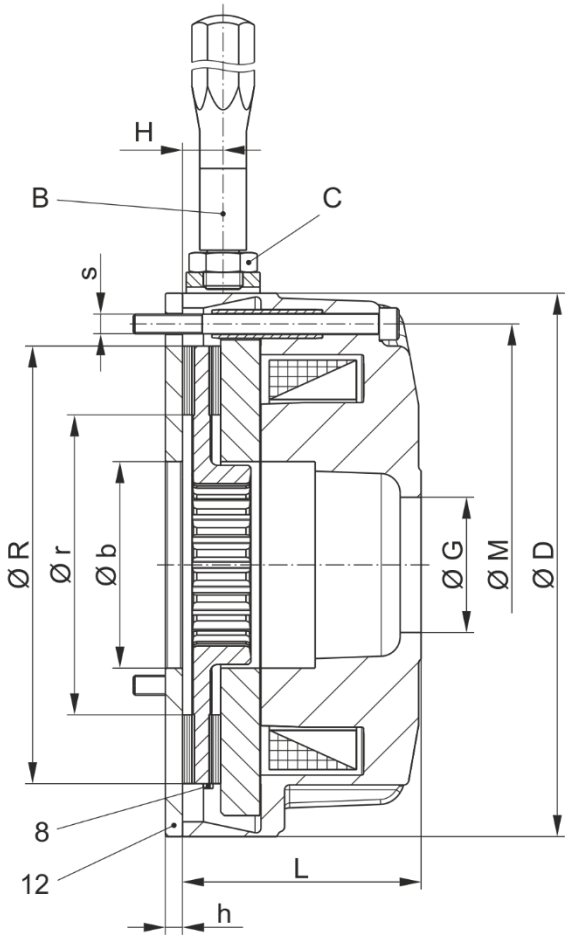

Fig. 16

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

Item	Name	Pcs.
1	Hub	1 [1)]
2	Coil carrier assembly (with magnetic coil)	1
3	Armature disk	1
4	Rotor	1
5	Thrust spring	acc. spring dimensioning
6	Cap screw	3
7	Hand release [1)]	1 [1)]
8	Shoulder screw	2
9	Cone plug	2
10	Type tag	1
11	Friction disk [1)] (only Sizes 4 to 60 / BRE 5 to 60)	1 [1)]
12	Flange plate [1)] (only Sizes 100 and 150 / BRE 100 and 150)	1 [1) 2)]

[1)] Additional part (option) - must be ordered separately.

[2)] For optional attachment of a flange plate, longer fixing screws (6) must be provided by the customer.

- For Size 100: M8 x 90 / DIN EN ISO 4762 / property class 8.8
- For Size 150: M8 x 100 / DIN EN ISO 4762 / property class 8.8

mayr® will take no responsibility or guarantee for replacement parts and accessories which have not been delivered by *mayr*®, or for damage resulting from the use of these products.

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Table 2: Technical Data (Sizes 4 and 8)

***mayr*® – Size:**	**4**		**8**	
***mayr*® – Type:**	**891.280.4 Dynamic brake**	**891.500.4 Holding brake**	**891.280.4 Dynamic brake**	**891.500.4 Holding brake**
Nord – Size:	**BRE 5**		**BRE 10**	
Nominal braking torque:	3.7 lbf.ft (5 Nm)		7.4 lbf.ft (10 Nm)	
Braking torque tolerance (conditioned):	+40 % / -20 %	+60 % / -0 %	+40 % / -20 %	+60 % / -0 %
Braking torque tolerance (without conditioning):	+40 % / -30 %	+60 % / -10 %	+40 % / -30 %	+60 % / -10 %
Reference speed n_{ref}:	5000 rpm		4000 rpm	
Max. speed n_{max} (brake engagement):	5000 rpm		4000 rpm	
Max. speed without friction work:	8800 rpm		7000 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 AWG20 (2 x 0.56 mm^2)		2 x AWG20 (2 x 0.56 mm^2)	
Cable length:	19.7 in (500 mm)		19.7 in (500 mm)	
Weight with cap screws, without additional parts:	2.4 lb (1.1 kg)		4 lb (1.8 kg)	
Hub (1) weight	0.07 lb (0.03 kg)		0.15 lb (0.068 kg) with bore Ø 0.591 in (Ø 15 mm)	
			0.11 lb (0.048 kg) with bore Ø 0.787 in (Ø 20 mm)	
Weight of hand release assembly (7)	0.15 lb (0.064 kg)		0.18 lb (0.08 kg)	
Friction disk (11) weight	0.09 lb (0.039 kg)		0.12 lb (0.053 kg)	
Nominal air gap “a” (Fig. 2):	0.0059 $^{+0.004}_{-0.002}$ in (0.15 $^{+0.1}_{-0.05}$ mm)		0.0078 $^{+0.004}_{-0.002}$ in (0.2 $^{+0.1}_{-0.05}$ mm)	
Max. permitted air gap “a” after wear (Fig. 2) [3]:	0.0157 in (0.4 mm)		0.0177 in (0.45 mm)	
Tightening torque Item 6:	1.8 lbf.ft (2.5 Nm)		3.7 lbf.ft (5.0 Nm)	
Tightening torque Item 8:	1.8 lbf.ft (2.5 Nm)		3.7 lbf.ft (5.0 Nm)	
Rotor thickness “new”:	0.2382 $^{-0.002}$ in (6.05 $^{-0.05}$ mm)		0.2717 $^{-0.002}$ in (6.9 $^{-0.05}$ mm)	
Minimum rotor thickness:	0.228 in (5.8 mm)		0.262 in (6.65 mm)	
Mass moment of inertia (hub + rotor):	0.0581 lbf.in^2 (17 kgmm^2)	0.0718 lbf.in^2 (21 kgmm^2)	0.0198 lbf.in^2 (58 kgmm^2)	0.2050 lbf.in^2 (60 kgmm^2)
Friction work $Q_{r\ 0.1}$ per 0.0039 in wear (per 0.1 mm wear):	40 x 10^6 J	8 x 10^6 J	65 x 10^6 J	13 x 10^6 J
Max. possible friction work $Q_{r\ ges.}$ total: (related to nominal air gap)	100 x 10^6 J	20 x 10^6 J	162 x 10^6 J	32 x 10^6 J
Duty cycle:	100 %			
Protection:	IP54 (IP55 [5])			
Ambient temperature:	-4 °F to +104 °F (-20 °C to +40 °C)			

[3] Customer-side changes of the spring configuration influence the maximum possible air gap.

[4] Referring to the reference speed n_{ref}

[5] 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/in^2 (< 0.5 J/mm^2) and sliding speeds < 33 ft/s (< 10 m/s).

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Table 3: Technical Data (Sizes 16 and 32)

mayr® – Size:	16		32	
mayr® – Type:	891.280.4 Dynamic brake	891.500.4 Holding brake	891.280.0 Dynamic brake	891.100.0 Holding brake
Nord – Size:	BRE 20		BRE 40	
Nominal braking torque:	15 lbf.ft (20 Nm)		30 lbf.ft (40 Nm)	
Braking torque tolerance (conditioned):	+40 % / -20 %	+60 % / -0 %	+40 % / -20 %	+60 % / -0 %
Braking torque tolerance (without conditioning):	+40 % / -30 %	+60 % / -10 %	+40 % / -30 %	+60 % / -10 %
Reference speed n_{ref}:	3000 rpm		1500 rpm	
Max. speed n_{max} (brake engagement):	3500 rpm	3600 rpm	3000 rpm	3600 rpm
Max. speed without friction work:	5600 rpm		4700 rpm	7800 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 AWG18 (2 x 0.88 mm²)		2 x AWG18 (2 x 0.88 mm²)	
Cable length:	19.7 in (500 mm)		23.6 in (600 mm)	
Weight with cap screws, without additional parts:	7.5 lb (3.4 kg)		9.9 lb (4.5 kg)	
Hub (1) weight	0.236 lb (0.092 kg) with bore Ø 0.787 in (Ø 20 mm)		0.414 lb (0.188 kg) with bore Ø 0.984 in (Ø 25 mm)	
	0.150 lb (0.068 kg) with bore Ø 0.984 in (Ø 25 mm)		0.284 lb (0.129 kg) with bore Ø 1.181 in (Ø 30 mm)	
Weight of hand release assembly (7)	0.236 lb (0.107 kg)		0.333 lb (0.151 kg)	
Friction disk (11) weight	0.238 lb (0.108 kg)		0.315 lb (0.143 kg)	
Nominal air gap “a” (Fig. 6):	0.0078 $^{+0.004}_{-0.002}$ in (0.2 $^{+0.1}_{-0.05}$ mm)		0.0078 $^{+0.004}_{-0.002}$ in (0.2 $^{+0.1}_{-0.05}$ mm)	
Max. permitted air gap “a” after wear (Fig. 6) [3]:	0.0276 in (0.7 mm)		0.0276 in (0.7 mm)	
Tightening torque Item 6:	6.6 lbf.ft (9 Nm)		6.6 lbf.ft (9 Nm)	
Tightening torque Item 8:	6.6 lbf.ft (9 Nm)		6.6 lbf.ft (9 Nm)	
Rotor thickness “new”:	0.3150 $^{-0.002}$ in (8.0 $^{-0.05}$ mm)		0.4094 $^{-0.002}$ in (10.4 $^{-0.05}$ mm)	
Minimum rotor thickness:	0.295 in (7.5 mm)		0.390 in (9.9 mm)	
Mass moment of inertia (hub + rotor):	0.5228 lbf.in² (153 kgmm²)	0.5399 lbf.in² (158 kgmm²)	1.4010 lbf.in² (410 kgmm²)	1.5309 lbf.in² (448 kgmm²)
Friction work $Q_{r\,0.1}$ per 0.0039 in wear (per 0.1 mm wear):	100 x 10⁶ J	20 x 10⁶ J	130 x 10⁶ J	30 x 10⁶ J
Max. possible friction work $Q_{r\,ges.}$ total: (related to nominal air gap)	500 x 10⁶ J	100 x 10⁶ J	600 x 10⁶ J	150 x 10⁶ J
Duty cycle:	100 %			
Protection:	IP54 (IP55 [5])			
Ambient temperature:	-4 °F to +104 °F (-20 °C to +40 °C)			

[3] Customer-side changes of the spring configuration influence the maximum possible air gap.

[4] Referring to the reference speed n_{ref}

[5] 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).

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Table 4: Technical Data (Sizes 60 and 100)

***mayr*® – Size:**	**60**		**100**	
***mayr*® – Type:**	**891.010.0 Dynamic brake**	**891.100.0 Holding brake**	**891.010.0 Dynamic brake**	**891.100.0 Holding brake**
Nord – Size:	**BRE 60**		**BRE 100**	
Nominal braking torque:	44 lbf.ft (60 Nm)		74 lbf.ft (100 Nm)	
Braking torque tolerance (conditioned):	+40 % / -20 %	+60 % / -0 %	+40 % / -20 %	+60 % / -0 %
Braking torque tolerance (without conditioning):	+40 % / -30 %	+60 % / -10 %	+40 % / -30 %	+60 % / -10 %
Reference speed n_{ref}:	1500 rpm		1500 rpm	
Max. speed n_{max} (brake engagement):	3000 rpm	3600 rpm	3000 rpm	3600 rpm
Max. speed without friction work:	7200 rpm		6200 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 AWG18 (2 x 0.88 mm^2)		2 x AWG18 (2 x 0.88 mm^2)	
Cable length:	23.6 in (600 mm)		39.4 in (1000 mm)	
Weight with cap screws, without additional parts:	16.3 lb (7.4 kg)		30.0 lb (13.6 kg)	
Hub (1) weight	0.701 lb (0.318 kg) with bore Ø 0.984 in (Ø 25 mm)		0.990 lb (0.449 kg)	
	0.590 lb (0.268 kg) with bore Ø 1.181 in (Ø 30 mm)			
	0.459 lb (0.208 kg) with bore Ø 1.378 in (Ø 35 mm)			
Weight of hand release assembly (7)	0.933 lb (0.423 kg)		1.188 lb (0.539 kg)	
Friction disk (11) weight	0.236 lb (0.107 kg)		-	
Flange plate (12) weight	-		4.577 lb (2.076 kg)	
Nominal air gap “a” (Fig. 10):	0.0098 $^{+0.004}_{-0.002}$ in (0.25 $^{+0.1}_{-0.05}$ mm)		0.0118 $^{+0.004}_{-0.002}$ in (0.3 $^{+0.1}_{-0.05}$ mm)	
Max. permitted air gap “a” after wear (Fig. 10) [3]:	0.0315 in (0.8 mm)		0.0354 in (0.9 mm)	
Tightening torque Item 6:	16.2 lbf.ft (22 Nm)		16.2 lbf.ft (22 Nm)	
Tightening torque Item 8:	2.6 lbf.ft (3.5 Nm)		5.9 lbf.ft (8.0 Nm)	
Rotor thickness “new”:	0.4390 $^{-0.002}$ in (11.15 $^{-0.05}$ mm)		0.5512 $^{-0.002}$ in (14 $^{-0.05}$ mm)	
Minimum rotor thickness:	0.417 in (10.6 mm)		0.528 in (13.4 mm)	
Mass moment of inertia (hub + rotor):	2.3032 $lbf.in^2$ (674 $kgmm^2$)		5.6520 $lbf.in^2$ (1654 $kgmm^2$)	
Friction work $Q_{r\,0.1}$ per 0.0039 in wear (per 0.1 mm wear):	110 x 10^6 J	110 x 10^6 J	140 x 10^6 J	60 x 10^6 J
Max. possible friction work $Q_{r\,ges.}$ total: (related to nominal air gap)	590 x 10^6 J	590 x 10^6 J	840 x 10^6 J	360 x 10^6 J
Duty cycle:	100 %			
Protection:	IP54 (IP55 [5])			
Ambient temperature:	-4 °F to +104 °F (-20 °C to +40 °C)			

[3] Customer-side changes of the spring configuration influence the maximum possible air gap.

[4] Referring to the reference speed n_{ref}

[5] 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/in^2 (< 0.5 J/mm^2) and sliding speeds < 33 ft/s (< 10 m/s).

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Table 5: Technical Data (Size 150)

***mayr*® – Size:**	**150**	
***mayr*® – Type:**	**891.010.0 Dynamic brake**	**891.100.0 Holding brake**
Nord – Size:	**BRE 150**	
Nominal braking torque:	111 lbf.ft (150 Nm)	
Braking torque tolerance (conditioned):	+40 % / -20 %	+60 % / -0 % [6]
Braking torque tolerance (without conditioning):	+40 % / -30 %	+60 % / -10 % [6]
Reference speed n_{ref}:	750 rpm	
Max. speed n_{max} (brake engagement):	4200 rpm	3000/3600 rpm [6]
Max. speed without friction work:	5400 rpm	
Nominal voltage U_N:	see Type tag	
Electrical power at nominal voltage P_N:	see Type tag	
Electrical connection, magnetic coil:	2 x AWG18 (2 x 0.88 mm^2)	
Cable length:	39.4 in (1000 mm)	
Weight with cap screws, without additional parts:	42.3 lb (19.2 kg)	
Hub (1) weight	1.612 lb (0.731 kg) with bore Ø 1.378 in (Ø 35 mm)	
	1.217 lb (0.552 kg) with bore Ø 1.772 in (Ø 45 mm)	
Weight of hand release assembly (7)	3.104 lb (1.408 kg)	
Flange plate (12) weight	3.951 lb (1.792 kg)	
Nominal air gap "a" (Fig. 14):	0.0118 $^{+0.004}_{-0.002}$ in (0.3 $^{+0.1}_{-0.05}$ mm)	
Max. permitted air gap "a" after wear (Fig. 14) [3]:	0.0354 in (0.9 mm)	
Tightening torque Item 6:	16.2 lbf.ft (22 Nm)	
Tightening torque Item 8:	5.9 lbf.ft (8.0 Nm)	
Rotor thickness "new":	0.6102 $^{-0.002}$ in (15.5 $^{-0.05}$ mm)	
Minimum rotor thickness:	0.587 in (14.9 mm)	
Mass moment of inertia (hub + rotor):	10.8256 $lbf.in^2$ (3168 $kgmm^2$)	
Friction work $Q_{r\ 0.1}$ per 0.0039 in wear (per 0.1 mm wear):	120 x 10^6 J	40 x 10^6 J
Max. possible friction work $Q_{r\ ges.}$ total: (related to nominal air gap)	720 x 10^6 J	240 x 10^6 J
Duty cycle:	100 %	
Protection:	IP54 (IP55 [5])	
Ambient temperature:	-4 °F to +104 °F (-20 °C to +40 °C)	

[3] Customer-side changes of the spring configuration influence the maximum possible air gap.

[4] Referring to the reference speed n_{ref}

[5] When installed, under a fan cover provided by the customer, protection IP55 is valid.

[6] For holding brakes (Type 891.10_._) and speeds > 3000 rpm, the lower tolerance limit of the braking torque is -20 %.

The stated value $Q_{r\ 0.1}$ is only a reference value for specific friction work values < 322 J/in^2 (< 0.5 J/mm^2) and sliding speeds < 33 ft/s (< 10 m/s).

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Table 6:
Switching Times [ms] Dynamic Brake – *mayr*® Types 891.280._ and 891.010._ (at nominal braking torque)

***mayr*® – Size:**	**4**	**8**	**16**	**32**	**60**	**100**	**150**
Nord – BRE Size:	**5**	**10**	**20**	**40**	**60**	**100**	**150**
Connection time t_1, DC switching:	18	20	30	50	55	68	80
Connection time t_1, AC switching:	160	220	320	400	500	640	730
Response delay on connection t_{11}, DC switching:	12	16	25	35	35	38	40
Response delay on connection t_{11}, AC switching:	130	175	240	300	350	400	450
Separation time t_2:	36	54	84	120	180	216	264

Table 7:
Switching Times [ms] Holding Brakes – *mayr*® Types 891.500._ and 891.100._ (at nominal braking torque)

***mayr*® – Size:**	**4**	**8**	**16**	**32**	**60**	**100**	**150**
Nord – BRE Size:	**5**	**10**	**20**	**40**	**60**	**100**	**150**
Connection time t_1, DC switching:	20	25	35	55	55	75	90
Connection time t_1, AC switching:	180	240	350	440	500	700	800
Response delay on connection t_{11}, DC switching:	15	20	30	40	35	42	45
Response delay on connection t_{11}, AC switching:	145	190	260	330	350	440	500
Separation time t_2:	36	54	84	120	180	216	264

Table 8: Changes in Switching Time t_{11} with Different Spring Configurations of the Dynamic Brakes

***mayr*® – Size**	**Nord – Size**	**Spring configuration**	**Article number Thrust spring set** [7)]	**Braking torque**	**t_{11}**
4	BRE 5	-	1050126	3.7 lbf.ft (5 Nm)	100 %
4	BRE 5	-	1050125	3.3 lbf.ft (4.5 Nm)	160 %
4	BRE 5	-	1057846	3 lbf.ft (4 Nm)	220 %
8	BRE 10	-	1050137	7.4 lbf.ft (10 Nm)	100 %
8	BRE 10	-	1050136	6.6 lbf.ft (9 Nm)	160 %
8	BRE 10	-	1058377	5.9 lbf.ft (8 Nm)	220 %
16	BRE 20	-	1050139	15 lbf.ft (20 Nm)	100 %
16	BRE 20	-	1050138	13 lbf.ft (18 Nm)	160 %
16	BRE 20	-	1058467	12 lbf.ft (16 Nm)	220 %
32	BRE 40	-	1050141	30 lbf.ft (40 Nm)	100 %
32	BRE 40	-	1050140	27 lbf.ft (36 Nm)	160 %
32	BRE 40	-	1058565	24 lbf.ft (32 Nm)	220 %
60	BRE 60	-	1059026	44 lbf.ft (60 Nm)	100 %
60	BRE 60	-	1058597	37 lbf.ft (50 Nm)	160 %
60	BRE 60	-	1058865	30 lbf.ft (40 Nm)	220 %
100	BRE 100	4 x D5.1 + 8 x D12.3		74 lbf.ft (100 Nm)	100 %
100	BRE 100	4 x D5.1 + 7 x D12.3		64 lbf.ft (87 Nm)	160 %
100	BRE 100	4 x D5.1 + 6 x D12.3		55 lbf.ft (75 Nm)	220 %
150	BRE 150	8 x D15.5		111 lbf.ft (150 Nm)	100 %
150	BRE 150	7 x D15.5		97 lbf.ft (131 Nm)	160 %
150	BRE 150	6 x D15.5		83 lbf.ft (112 Nm)	220 %

[7)] For Sizes 4 to 60, the complete thrust spring sets must be replaced to change the braking torque.

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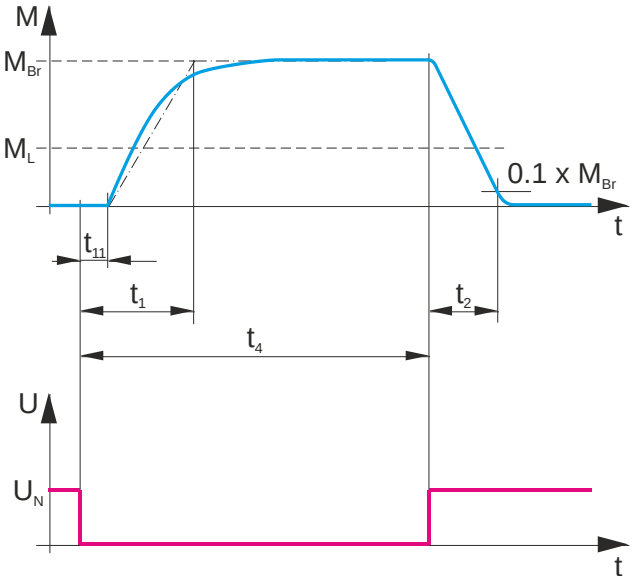
Torque-Time Diagram



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 be optionally retrofitted with friction disks (Item 11 / Sizes 4 - 60) or flange plates (Item 12 / Sizes 100 and 150) as well as a hand release (7).

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 (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.
The hubs (1), hand releases (7) and friction disks (11) or flange plates (12) are not included in the standard scope of delivery. These items (additional items) can be ordered separately if required.
The required *mayr*® article number can be found in the respective assembly drawing for the brake.

The following are included loose in delivery:

- Rotor (4)
- Cap screws (6)

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.

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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 **0.0031 in (0.08 mm)** for Sizes 4 to 8, and of **0.0039 in (0.1 mm)** for Sizes 16 to 150, 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 16)

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.
   On Sizes 4 to 32, the turned recess must be facing in the direction of the motor bearing shield.
2. If necessary, guide the friction disk (11) or flange plate (12) over the shaft and position it onto the machine wall (please make sure that the bores in the friction disk (11) or flange plate (12) and the threaded holes in the machine wall align).
3. Measure the rotor thickness of the new rotor (4).
   The nominal dimension acc. Technical Data must be given.
4. 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!
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 evenly all around onto the machine wall using the cap screws (6) **with a torque wrench and a tightening torque acc. Technical Data.**
7. The air gap “a” is specified by design – adjustment not necessary.
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 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/flange plate and de-energized!

DANGER

Please actuate the hand release carefully. Any existing loads are put into motion when the hand release is actuated.

The inspection dimension “x” (Figs. 19 to 21) is only used for hand release adjustment in dismantled condition.

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Parts List of the Hand Release
(Only use *mayr*® original parts)

Item	Name
A	Switch bracket
B	Hand release rod
C	Hexagon nut (only on Size 150)
D	Hexagon head screw (on Sizes 4 to 16) Threaded bolt (on Sizes 32 to 100) Cap screw (on Size 150)
E	Pressure plate (only on Sizes 4 to 16 and 150)
F	Thrust spring
G	Hexagon nut (on Sizes 4 to 100) Cross-threaded bolt (on Size 150)
H	Washer (only for Sizes 4 to 100)

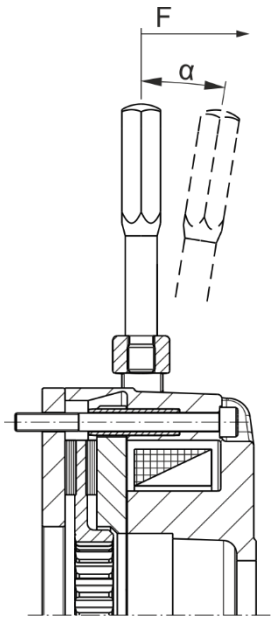

Fig. 17

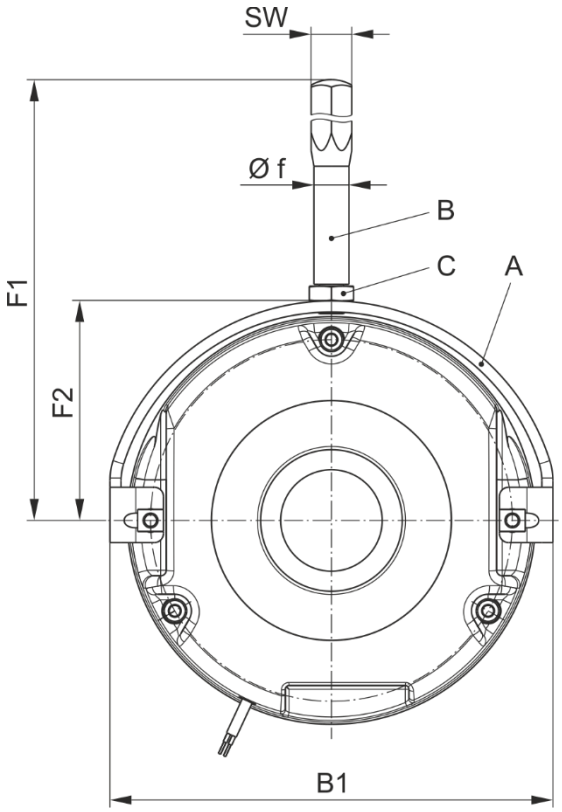

Fig. 18

Table 9: Technical Data for Optional Hand Release

***mayr*® – Size:**	**4**	**8**	**16**	**32**	**60**	**100**	**150**
Nord – BRE Size:	**5**	**10**	**20**	**40**	**60**	**100**	**150**
Hand release force	7.9 lbf (35 N)	15.7 lfb (70 N)	22.5 lbf (100 N)	29.2 lbf (130 N)	49.5 lbf (220 N)	58.5 lbf (260 N)	65.2 lbf (290 N)
Release angle α (Fig. 17)	7°	7°	7°	8°	10°	12°	13°
Inspection dimension x +0.0039 in (+0.1 mm) (Figs. 19 – 21)	0.0354 in (0.9 mm)	0.0433 in (1.1 mm)	0.0630 in (1.6 mm)	0.0709 in (1.8 mm)	0.0866 in (2.2 mm)	0.0866 in (2.2 mm)	0.0866 in (2.2 mm)
Length "F1" of the hand release (Fig. 18)	4.252 in (108 mm)	4.626 in (117.5 mm)	5.157 in (131 mm)	6.535 in (166 mm)	8.996 in (228.5 mm)	10.512 in (267 mm)	13.425 in (341 mm)
Dimension "F2" of the hand release (Fig. 18)	2.126 in (54 mm)	2.500 in (63.5 mm)	3.031 in (77 mm)	3.327 in (84.5 mm)	3.957 in (100.5 mm)	4.843 in (123 mm)	4.685 in (119 mm)
Wrench opening for the hand release rod (Item B)	SW11	SW11	SW11	SW14	SW17	SW17	SW22
Ø f of the hand release rod (Item B)	0.315 in (8 mm)	0.315 in (8 mm)	0.315 in (8 mm)	0.394 in (10 mm)	0.551 in (14 mm)	0.551 in (14 mm)	0.748 in (19 mm)
Width "B1" of the hand release (Fig. 18)	3.346 in (85 mm)	3.898 in (99 mm)	4.882 in (124 mm)	5.827 in (148 mm)	6.457 in (164 mm)	7.756 in (197 mm)	9.449 in (240 mm)
Number of turns "Y" of the hexagon nuts (G) or cap screws (D) / see Figs. 19 to 21	1.7	1.5	2.0	2.0	2.0	1.6	1.6

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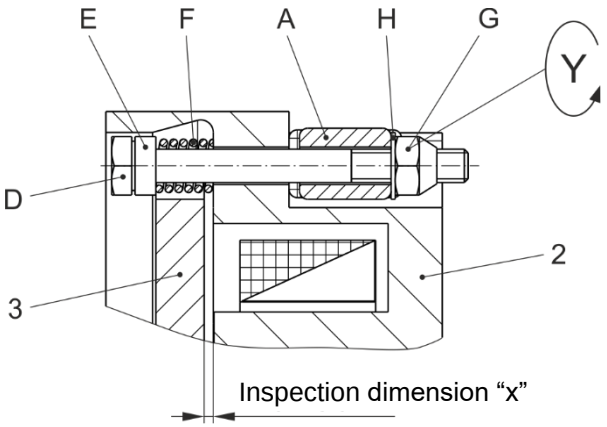

Fig. 19 (Sizes 4 to 16 / BRE 5 to 20)

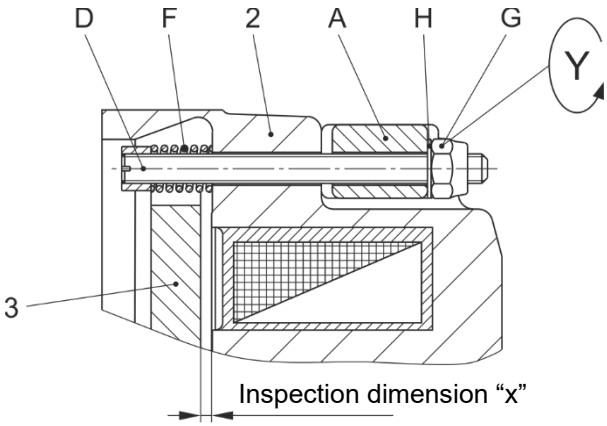

Fig. 20 (Sizes 32 to 100 / BRE 40 to 100)

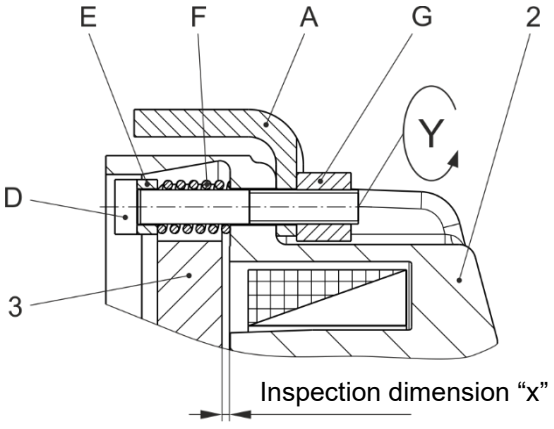

Fig. 21 (Size 150 / BRE 150)

Hand Release Installation for Sizes 4 to 100 (Figs. 17, 18, 19 and 20)

1. **Only Sizes 4 to 16:**
   Push the pressure plates (E) onto the hexagon head screws (D).
2. Push the thrust springs (F) onto the hexagon head screw / threaded bolts (D).
3. Push the hexagon head screws / threaded bolts (D) from the inside (you should be facing the armature disk (3)) into the hand release bores in the coil carrier (2).
4. Mount the switch bracket (A), add the washers (H) as well as the self-locking hexagon nuts (G) and lightly screw them on.
5. Tighten both hexagon nuts (G) until the armature disk (3) lies evenly against the coil carrier (2).
   For this purpose, for Sizes 4 to 16, the hexagon head screws (D) must be countered against turning.
6. Loosen both hexagon nuts (G) by "Y" turns (see Table 9), thereby producing an air gap between the armature disk (3) and the coil carrier (2). This gives you inspection dimension "x".

CAUTION

An uneven adjustment dimension on the hand release
or incorrect adjustment can cause the brake to malfunction or the braking function to be lost.

7. After installing the fan cover, paint the hand release rod (B) thread lightly with Loctite 243 (screw securement). Screw the hand release rod (B) into the switch bracket (A) and tighten it.

Hand Release Installation for Size 150 (Figs. 17, 18 and 21)

1. Push the pressure plates (E) onto the cap screws (D).
2. Push the thrust springs (F) onto the cap screws (D).
3. Push the cap screws (D) from the inside (you should be facing the armature disk (3)) into the hand release bores in the coil carrier (2).
4. Position the switch bracket (A) and place the cross-threaded bolts (G)
   and screw them on lightly.
5. Tighten both cap screws (D) until the armature disk (3) lies evenly against the coil carrier (2).
6. Loosen both cap screws (D) by “Y” turns (see Table 9), thereby producing an air gap between the armature disk (3) and the coil carrier (2). This gives you inspection dimension "x".

CAUTION

An uneven adjustment dimension on the hand release or incorrect adjustment can cause the brake to malfunction or the braking function to be lost.

Ensure that the two cross-threaded bolts (G) are positioned correctly in the grooves of the switch bracket (A).

7. After installing the fan cover, screw the hexagon nut (C) onto the hand release rod (B). Paint the hand release rod (B) thread lightly with Loctite 243 (screw securement). Screw the hand release rod (B) into the switch bracket (A) and counter it with the hexagon nut (C).

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Maintenance

The amount of wear on the rotor (4) 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 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:

- ❑ Measuring the release voltage.
  The release voltage may be up to max. 90 % of the nominal voltage on a warm brake.
- ❑ Measuring the rotor thickness on the dismantled brake.
  For minimum rotor thickness, see Technical Data.

We recommend the following regular inspection intervals:

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:
  on Sizes 4 to 32: 0.5 °.
  on Sizes 60 to 150: 0.3°.
  Inspection on an engaged brake and load-free output by turning the motor shaft.
- ➢ Inspection of the armature disk (3), the friction disk (11) or the flange plate (12) and the customer flange for plane parallelism and wear (excessive formation of scoring).
- ➢ Clean the brake.

Replacing the rotors

- ➢ Once the minimum rotor thickness has been reached.
- ➢ 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: Si = 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.

Replacing the Rotor (4)

Before replacing the rotor (4)

- ❑ Clean the brake.

Please observe the “Cleaning the Brake” section, see page 42.

- ❑ Measure the rotor thickness of the new rotor (4).
  The nominal dimension acc. Technical Data 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 acc. Technical Data.

For further assembly of the brake, please follow the Brake Installation instructions, followed by Brake Inspection and Run-in Procedure, see pages 21 and 40.

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Part 3: Sizes 250 and 500

Brake Illustrations Size 250

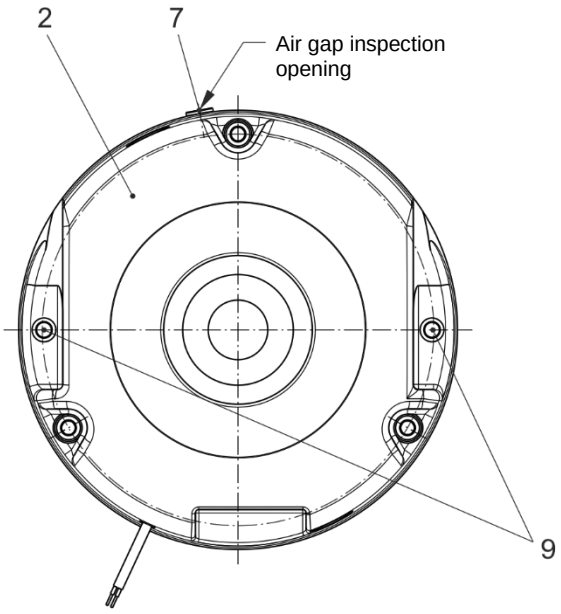

Fig. 22 (Type 891._ _ _.0)

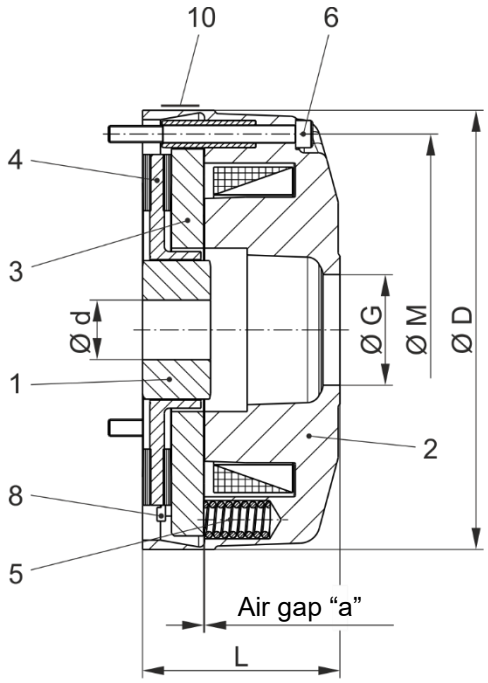

Fig. 23 (Type 891._ _ _.0)

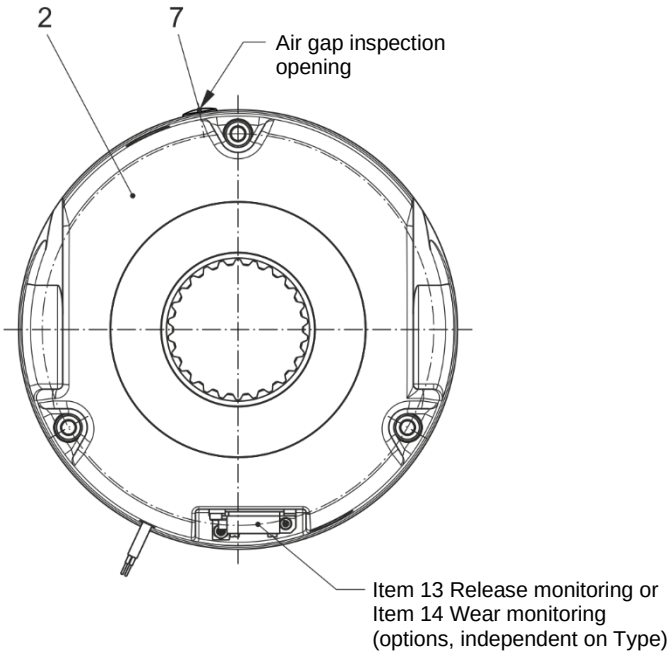

Fig. 24 (Type 891._ _ _.1)

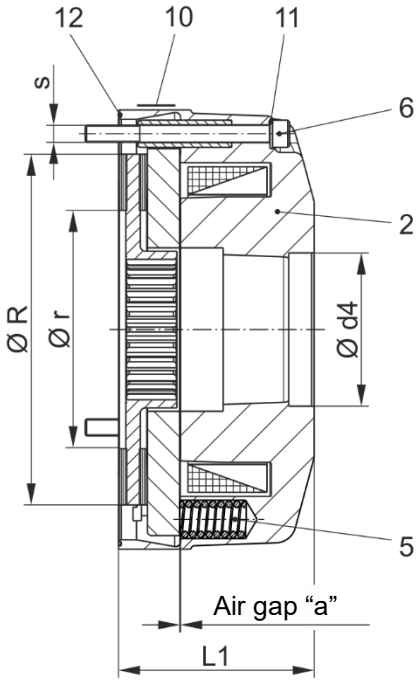

Fig. 25 (Type 891._ _ _.1)

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Brake Illustrations Size 500

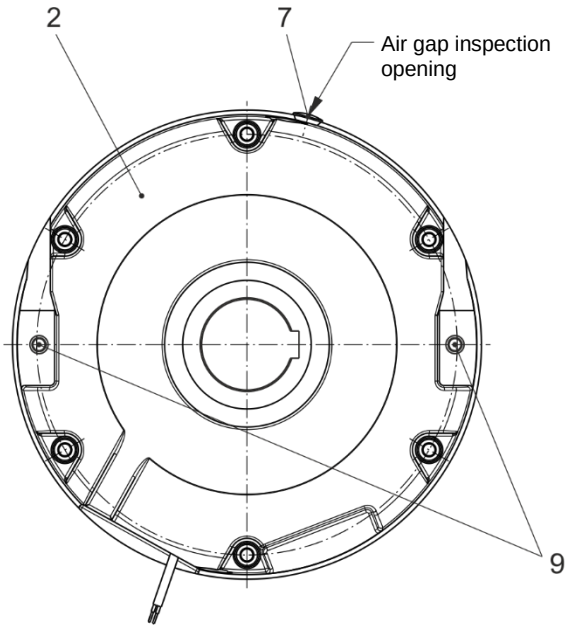

Fig. 26 (Type 891._ _ _.0)

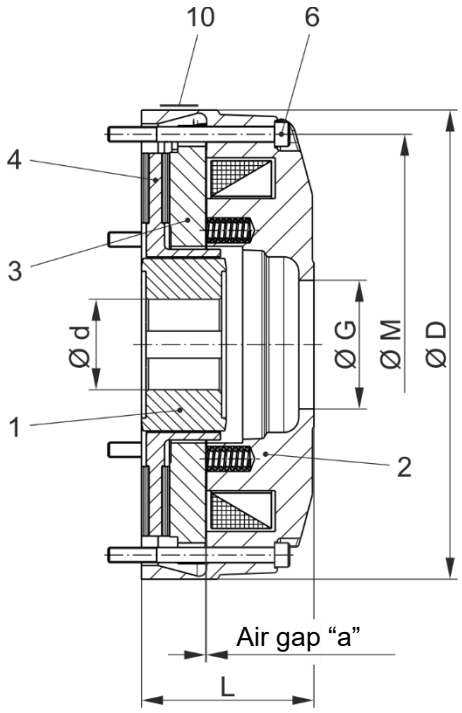

Fig. 27 (Type 891._ _ _.0)

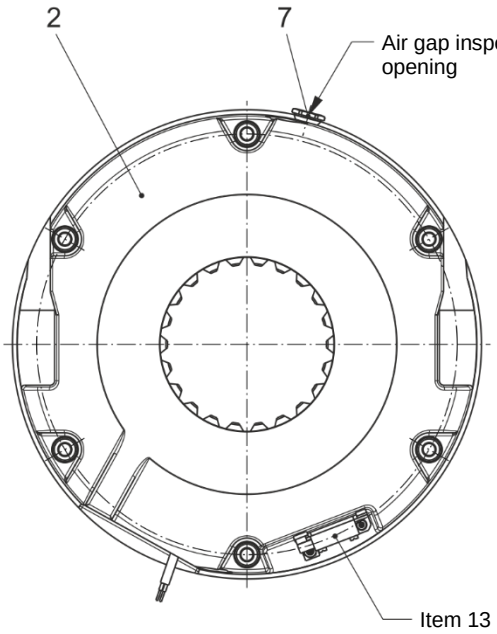

Fig. 28 (Type 891._ _ _.1)

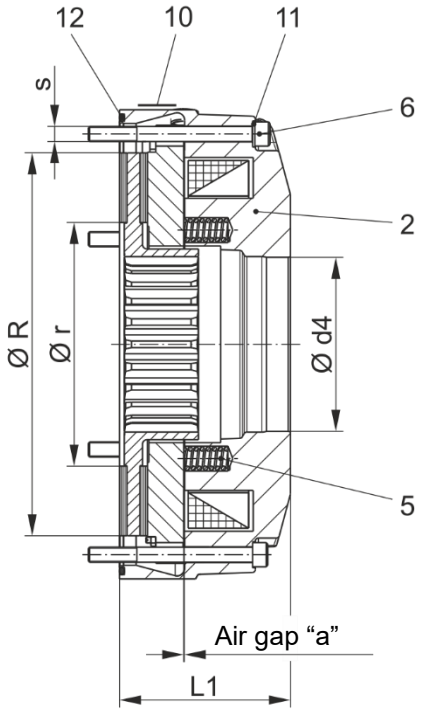

Fig. 29 (Type 891._ _ _.1)

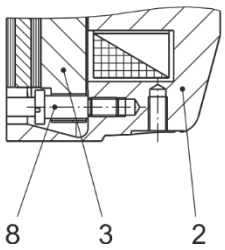

Fig. 30

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

				Pcs.	
Item	**Name**			**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.

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Table 10: Technical Data

mayr® – Size:	250		500	
mayr® – Type:	891.01._ Dynamic brake	891.10._ Holding brake	891.02._ Dynamic brake	891.10._ Holding brake
Nord – Size:	BRE 250		BRE 400	
Nominal braking torque:	184 lbf.ft (250 Nm)		295 lbf.ft (400 Nm)	
Braking torque tolerance (conditioned):	+40 % / -20 %	+60 % / -0 %	+40 % / -20 %	+60 % / -0 %
Braking torque tolerance (without conditioning):	+40 % / -30 %	+60 % / -10 %	+40 % / -30 %	+60 % / -10 %
Reference speed n_{ref}:	750 rpm		750 rpm	
Max. speed n_{max} (brake engagement):	3600 rpm	2500 rpm	3000 rpm	2000 rpm
Max. speed without friction work:	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 AWG18 (2 x 0.88 mm²)		2 x AWG18 (2 x 0.88 mm²)	
Cable length:	39.4 in (1000 mm)		59 in / 39.4 in (1500 mm / 1000 mm)	
Weight with cap screws, without additional parts:	57.1 lb (25.9 kg)		79.1 lb (35.9 kg)	
Hub (1) weight	2.16 lb (0.98 kg)		6.50 lb (2.95 kg)	
Weight of hand release assembly	2.80 lb (1.27 kg)		5.42 lb (2.46 kg)	
Weight of hand release rod	0.68 lb (0.31 kg)		1.61 lb (0.73 kg)	
Nominal air gap “a” +0.008/-0.002 in (+0.20/-0.05 mm) (Figs. 23/25/27/29):	0.0138 $^{+0.004}_{-0.002}$ in (0.35 $^{+0.1}_{-0.05}$ mm)		0.0157 $^{+0.008}$ in (0.40 $^{+0.2}$ mm)	
Max. permitted air gap “a” after wear [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:	0.6457 in (16.4 mm)		0.7047 in (17.9 mm)	
Mass moment of inertia (hub + rotor):	0.170 lbf.ft² (71.8 x 10^{-4} kgm²)		0.510 lbf.ft² (215 x 10^{-4} kgm²)	
Friction work $Q_{r\,0.1}$ per 0.0039 in wear (per 0.1 mm wear):	130 x 10^6 J	50 x 10^6 J	170 x 10^6 J	70 x 10^6 J
Max. possible friction work $Q_{r\,ges.}$ total: (related to nominal air gap)	780 x 10^6 J	220 x 10^6 J	1700 x 10^6 J	350 x 10^6 J
Duty cycle:	100 %			
Protection (Type 891._ _ _.0):	IP54 (IP55 [3])			
Protection (Type 891._ _ _.1):	IP66			
Ambient temperature:	-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] Referring to the reference speed n_{ref}

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

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Table 11:
Switching Times [ms] Dynamic Brake – *mayr*®-Type 891.01_._ (at nominal braking torque)

***mayr*® – Size:**	**250**	**500**
Nord – Size:	**BRE 250**	**BRE 400**
Connection time t_1, DC switching:	100	160
Connection time t_1, AC switching:	1100	1760
Response delay on connection t_{11}, DC switching:	50	48
Response delay on connection t_{11}, AC switching:	700	1120
Separation time t_2:	348	348

Table 12:
Switching Times [ms] Holding Brake – *mayr*®-Type 891.100._ (at nominal braking torque)

***mayr*® – Size:**	**250**	**500**
Nord – BRE Size:	**BRE 250**	**BRE 400**
Connection time t_1, DC switching:	110	180
Connection time t_1, AC switching:	1200	1900
Response delay on connection t_{11}, DC switching:	60	55
Response delay on connection t_{11}, AC switching:	800	1200
Separation time t_2:	487	487

Table 13: Changes in Switching Time t_{11} with Different Spring Configurations of the Dynamic Brakes

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 %
250	4 x D21.5	92 lbf.ft (125 Nm)	Release is quicker; engagement takes longer
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 %
500	9 x D15 + 2 x D24.5	221 lbf.ft (300 Nm)	Release is quicker; engagement takes longer
500	4 x D15 + 2 x D24.5	148 lbf.ft (200 Nm)	Release is quicker; engagement takes longer

On brakes with reduced braking torque and/or operation with fast acting rectifiers, unpermittedly high wear values will not be noticed via the brake switching behavior, as the magnetic coil is, in this case, capable of allowing a very large pull-in distance for the armature disk (3). Unpermittedly high wear relaxes the thrust springs (5), leading to a drop in torque. The permitted wear is stated in Table 10.

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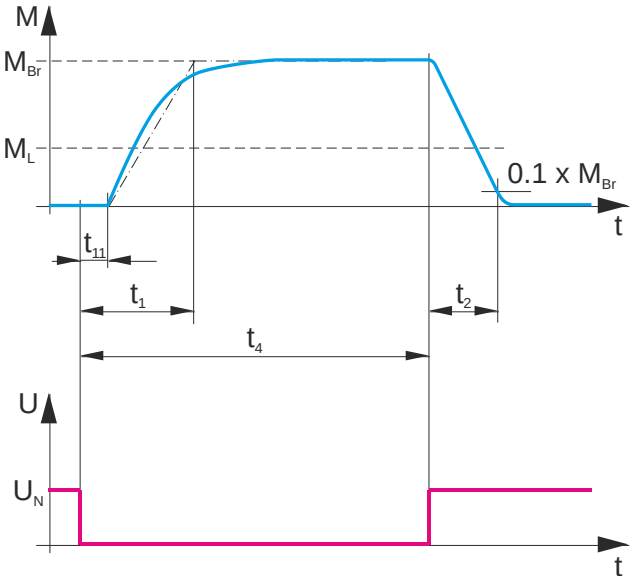
Torque-Time Diagram



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-energized 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.
The following are included loose in delivery:

- 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.

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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 392 °F (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). 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. 22 to 30)

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 10 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 (6) 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 34.
8. Establish the electrical connection of the brake.

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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-energized!

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

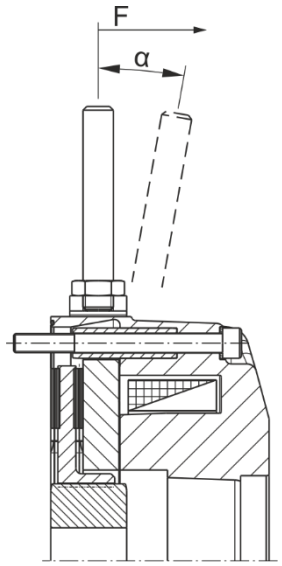

Fig. 31

Parts List

(Only use *mayr*® original parts)

Item	Name
A	Switch bracket
B	Hand release rod
C	Hexagon nut (only on Size 250)

For a complete Parts List, Technical Data and Installation, see the separate Installation Instructions for the hand release.

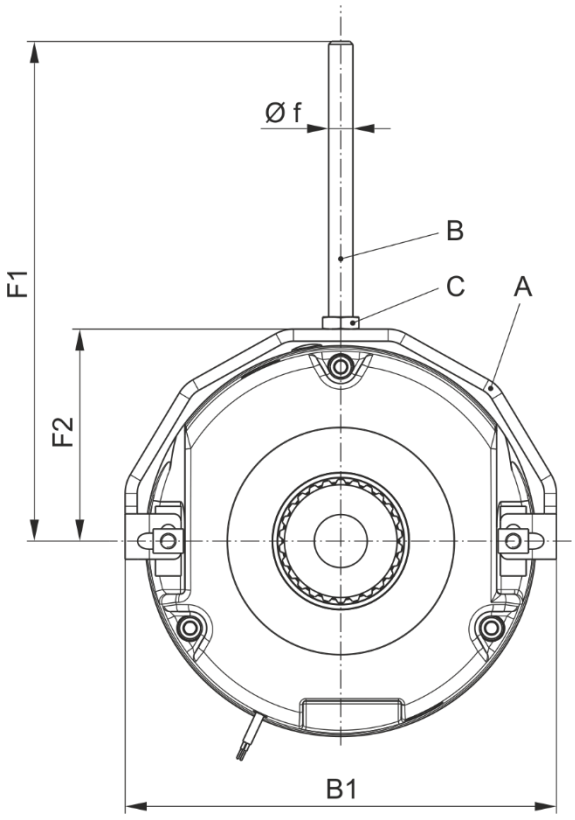

Fig. 32

Table 14: Technical Data for Optional Hand Release

mayr® – Size:	250	500
Nord – BRE Size:	250	400
Hand release force	74 lbf (330 N)	81 lbf (360 N)
Release angle α (Fig. 31)	10°	10°
Length "F1" of the hand release (Fig. 32)	12.992 in (330 mm)	14.055 in (357 mm)
Dimension "F2" of the hand release (Fig. 32)	5.512 in (140 mm)	7.028 (178.5 mm)
Ø f of the hand release rod (Item B)	0.630 in (16 mm)	0.984 in (25 mm)
Width "B1" of the hand release (Fig. 32)	11.220 in (285 mm)	12.205 (310 mm)

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Option: Microswitch for Brake Monitoring (Items 13/14 / Figs. 24 and 28)

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)

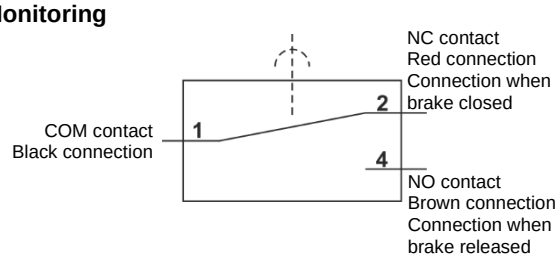
The brakes are supplied optionally with manufacturer-side installed and adjusted release monitoring device.
A microswitch emits a signal for every brake condition change: “brake opened" or "brake closed”.

The customer is responsible for a signal evaluation of both conditions.
From the point at which the brake is 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 14)

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

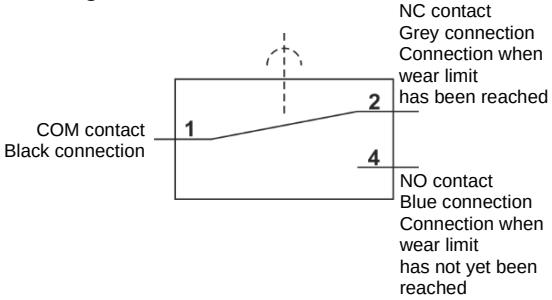
Function

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 **0.0374 in (0.95 mm) for Size 250** or **0.0394 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



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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 1.57 in (40 mm) deep (see Fig. 33), so that the distance between the armature disk (3) and the coil carrier (2) can be measured.

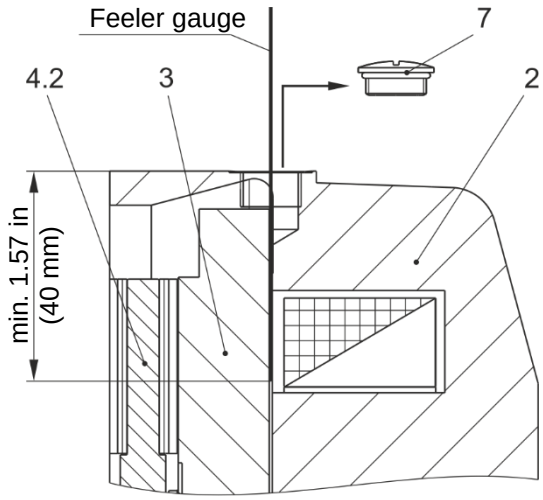

Fig. 33

Maintenance

The amount of wear on the rotor (4) 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 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 10.
- ❑ Measuring the rotor thickness on the dismantled brake.
  See Table 10 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 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: Si = 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.

On brakes with reduced braking torque and/or operation with fast acting rectifiers, unpermittedly high wear values will not be noticed via the brake switching behavior, as the magnetic coil is, in this case, capable of allowing a very large pull-in distance for the armature disk (3). Unpermittedly high wear relaxes the thrust springs (5), leading to a drop in torque. The permitted wear is stated in Table 10.

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Replacing the Rotor (4)

Before replacing the rotor (4)

❑ Clean the brake.

Please observe the section “Cleaning the Brake”, see page 42.

❑ Measure the rotor thickness of the new rotor (4).
The nominal dimension acc. Table 10 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:

4) 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.

5) Lay the new armature disk (3) onto the coil carrier (2) or the thrust springs (5) (observe installation position).
6) 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 31 and 40.

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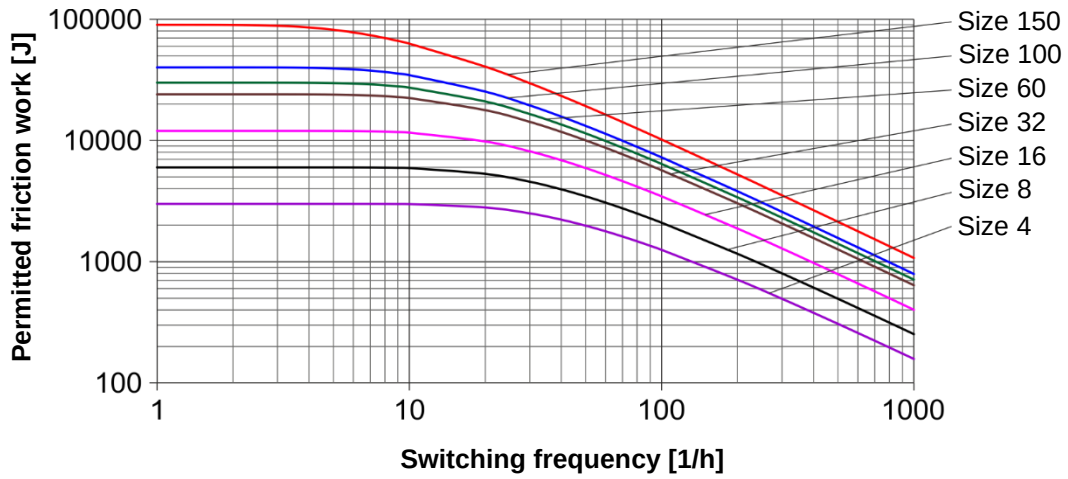
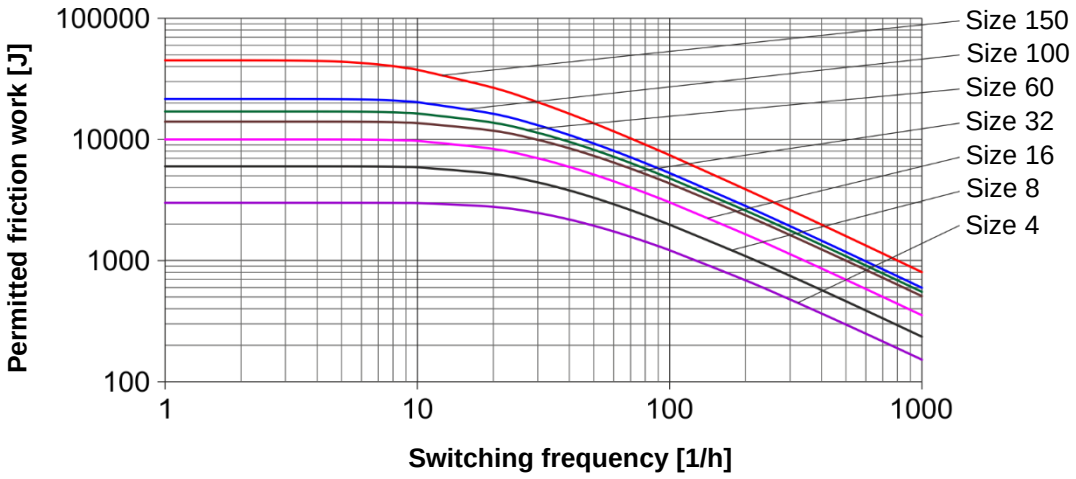
Part 4: Permitted Friction Work Values

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 (see Technical Data).

Friction Power Diagram 1 for Dynamic Brakes at Reference Speed (Size 4 to 150)



Friction Power Diagram 2 for Dynamic Brakes at Maximum Speed (Size 4 to 150)



Permitted friction work at other speeds (customer specific)

The permitted friction work values 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 Technical Data)
n_{max} = Maximum speed (see Technical Data)

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

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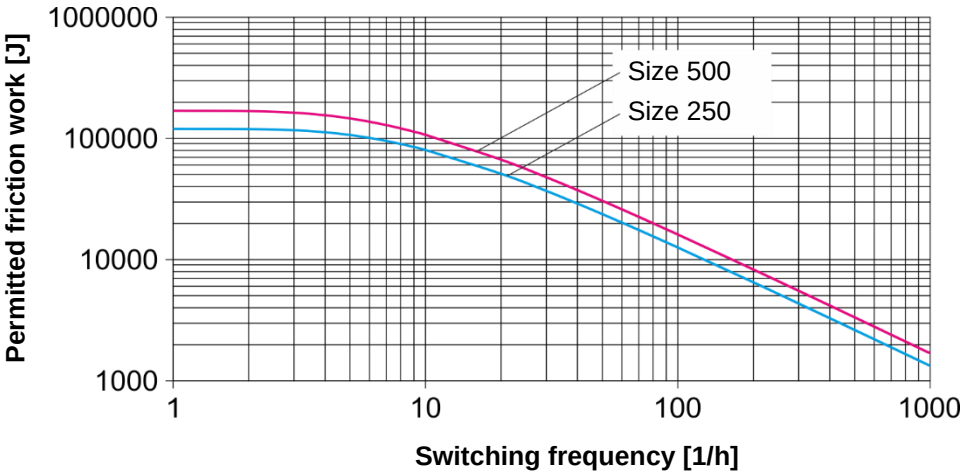
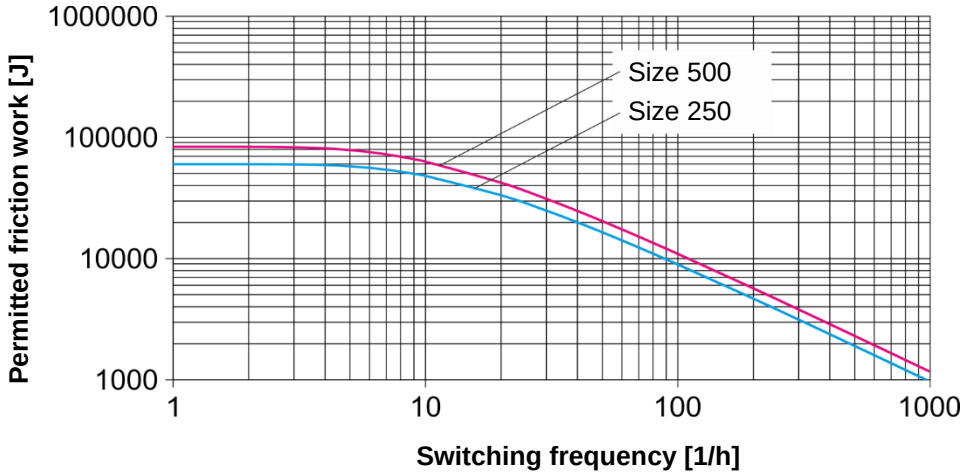
Friction Power Diagram 3 for Dynamic Brakes at Reference Speed (Size 250 and 500)



Friction Power Diagram 4 for Dynamic Brakes at Maximum Speed (Size 250 and 500)



Permitted friction work at other speeds (customer specific)

The permitted friction work values 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 Technical Data)
n_{max} = Maximum speed (see Technical Data)

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

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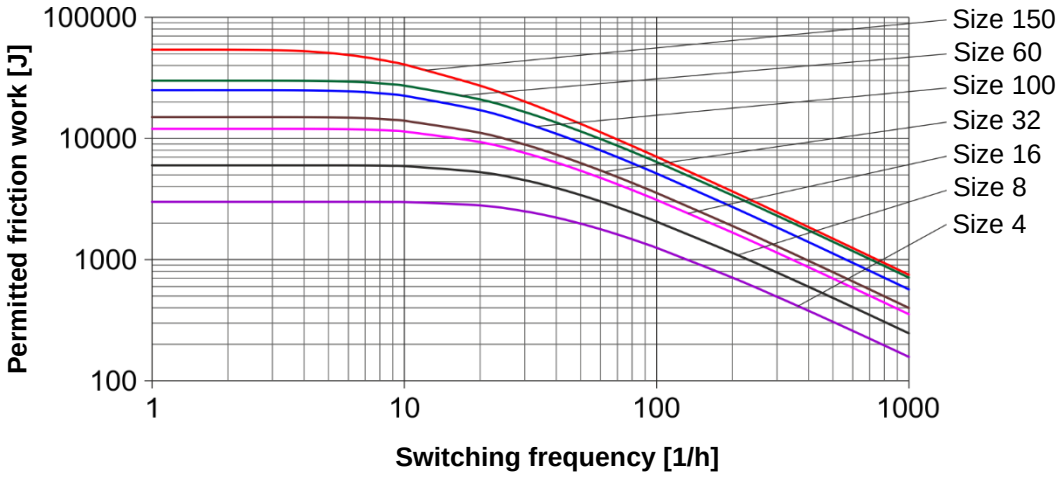
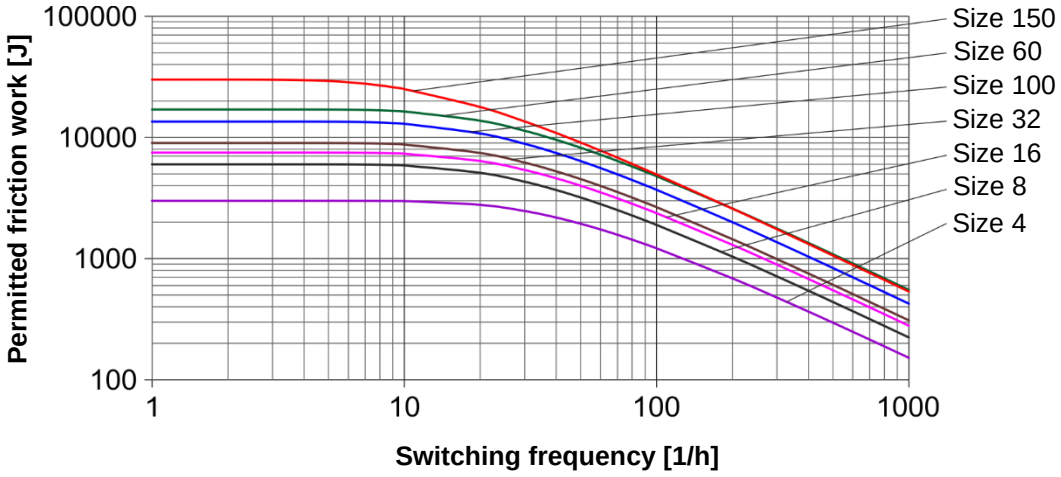
Friction Power Diagram 5 for Holding Brakes at Reference Speed (Size 4 to 150)



Friction Power Diagram 6 for Holding Brakes at maximum Speed (Size 4 to 150)



Permitted friction work at other speeds (customer specific)

The permitted friction work values 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 Technical Data)
n_{max} = Maximum speed (see Technical Data)

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

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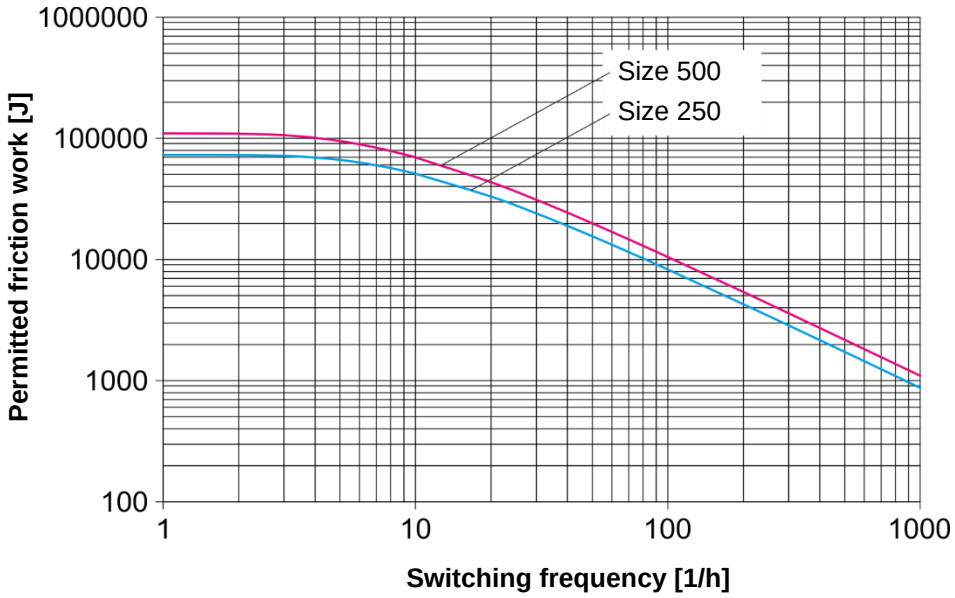
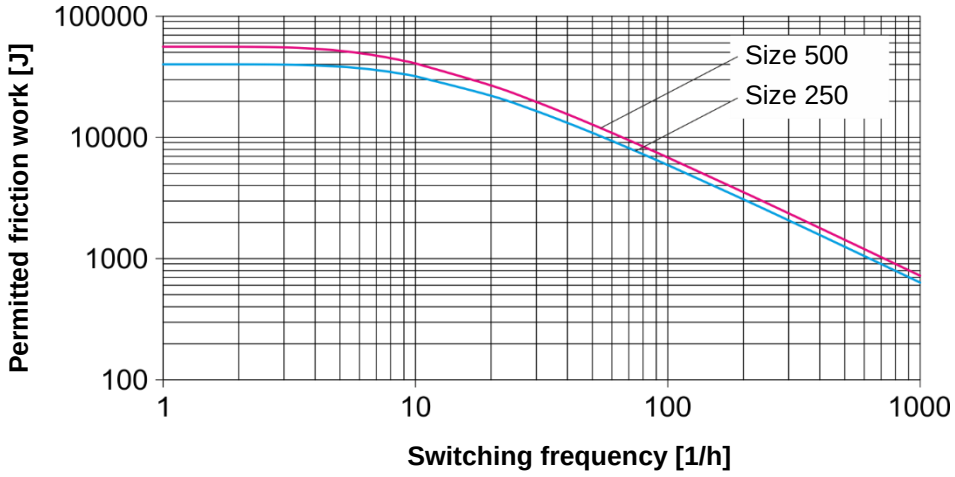
Friction Power Diagram 7 for Holding Brakes at Reference Speed (Size 250 and 500)



Friction Power Diagram 8 for Holding Brakes at Maximum Speed (Size 250 and 500)



Permitted friction work at other speeds (customer specific)

The permitted friction work values 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 Technical Data)
n_{max} = Maximum speed (see Technical Data)

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

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Part 5: General Points (Independent of Size)

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.
The nominal braking torque, taking into account the tolerance ranges specified in the Technical Data, is valid for static and dynamic applications.

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.
Without conditioning the friction pairing in new condition, the braking torque tolerances as stated in the Technical Data under “Braking torque tolerance (without conditioning)” must be observed.

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 for <u>dynamic brakes</u>:

Brake run-in / conditioning takes place as a result of the frequent dynamic braking actions during operation.
During initial start-up and rotor replacement, approx.
10 dynamic braking actions for Sizes 4 to 150 or
5 dynamic braking actions for Sizes 250 and 500
must be carried out.

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

For holding applications with few/no dynamic braking actions, please use a holding brake. Danger of loss of braking torque!

Recommendation for <u>holding brakes</u>:

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: Si ≥ 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).

➔ **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”.

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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 (± 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 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 Technical Data 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.

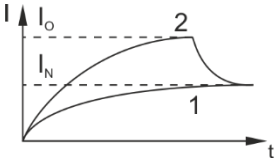
Field build-up with normal excitation

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.

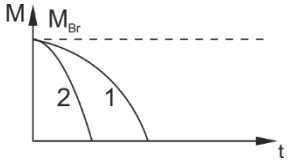
Field build-up with overexcitation

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

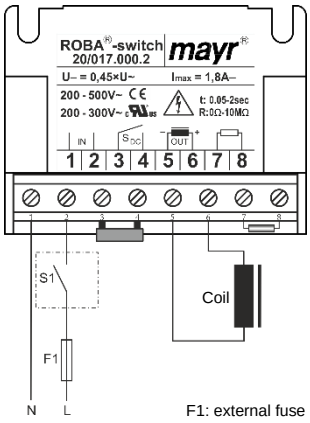


Braking torque path



Magnetic Field Removal

AC-side switching



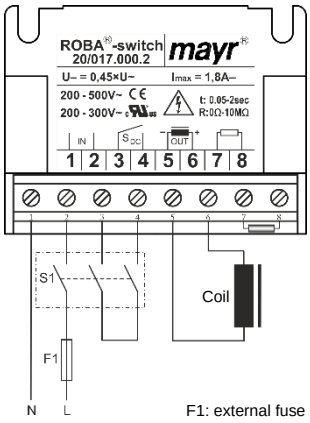
F1: external fuse

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



F1: external fuse

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

When switching DC-side, high voltage peaks are produced in the coil, which 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.

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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.

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Malfunctions / Breakdowns

Malfunction	Result of Malfunction	Possible Causes	Solutions ❑ The brake must always be dismantled in order to remove damage and malfunctions. ❑ Damaged parts must be replaced in order to solve the respective problem. ❑ The brake must be cleaned before re-installation.
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 toothing due to abraded or worn particles	Check the hub and rotor toothing; maintain suitable maintenance intervals
		Wear, damage, deformation or breakage of the hub and rotor toothing	
	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

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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
		Change in friction behavior on the friction lining due to exceeding the maximum permitted sliding speed	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.

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