

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.0_ _1X Sizes 2 – 500

(B.8.1.ATEX.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.

The product must be specially marked for use in areas where there is a danger of explosion.

The product will only be marked if it is ordered especially for an Ex-area.

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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 explosion protection



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. 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 on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment

The electromagnetic brake as well as the rectifiers / microswitches / proximity switches required for control / self-monitoring fulfil the requirements laid down in the EU Directive 2011/65/EU (RoHS) (Restriction on the Use of Certain Hazardous Substances, such as lead (0.1 %), mercury (0.1 %), cadmium (0.01 %), hexavalent chromium (0.1 %), polybrominated biphenyls (PBB) (0.1 %), polybrominated diphenylethers (PBDE) (0.1 %)). In addition, the substances listed in the delegated Directive 2015/863 EU – 22 July 2019, Di(2-ethylhexyl)phthalate (DEHP) (0.1 %), butylbenzylphthalate (BBP) (0.1 %), dibutylphthalate (DBP) (0.1 %) and diisobutylphthalate (DIBP) (0.1 %) are also not included.

ATEX Directive 2014/34/EU

For confirmation of the conformity, please see page 28.

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.



ROBA-stop®-M brakes are permitted in ATEX designs for use in areas where there is a danger of explosion for zones 2/22 and are classified as

II3G Ex nA IIC T3 Gc X

II3D Ex tc IIIC T120°C IP65/IP54 Dc X.

For application in Ex-areas, please observe the special safety-related guidelines and directives.



Explosive gas mixtures or dust concentrations can ignite if they come into contact with hot, live and moving parts of electrical components and cause severe or lethal injuries.

- ☐ 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.
- ☐ Connect the protective earth conductor.
- ☐ Cable connections must not be placed under mechanical strain.
- ☐ Check electrical components for signs of damage before putting them into operation. Never bring them into contact with water or other fluids.
- ☐ Please observe the EN 60204-1 requirements for electrical connection when using in machines.



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

Guidelines for Electromagnetic Compatibility (EMC)

In accordance with the EMC directives 2014/30/EU, the individual components produce no emissions. However, functional components e.g. mains-side energisation of the brakes with rectifiers, phase demodulators, ROBA®-switch devices or similar controls can produce disturbance which lies above the allowed limit values. For this reason it is important to read the Installation and Operational Instructions very carefully and to keep to the EMC directives.

Application Conditions



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

- ☐ Mounting dimensions and connection dimensions must be adjusted according to the size of the brake at the place of installation.
- ☐ 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. Special protective measures are possible on customer request.

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.

Safety Regulations

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

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.

Climate Conditions

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

CAUTION



Reduction in braking torque possible

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

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

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

CAUTION



Brake malfunction possible

Condensation can form on the brake and cause malfunctions:

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

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

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



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

Intended Use

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

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

Earthing Connection

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

Class of Insulation F (+155 °C)

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

Protection IP65 (design without hand release)

When installed, dust-proof and protected against contact as well as against jet water from a nozzle coming from any direction.

Protection IP54 (design with hand release)

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



The IP protection types are only fulfilled if the brake is mounted correctly onto the motor bearing plate with sealing elements. Please observe the Installation Conditions on page 10.

Brake Storage

- ☐ Store the brakes in a horizontal position, in dry rooms and dust and vibration-free.
- ☐ Relative air humidity < 50 %.
- ☐ Temperature without major fluctuations within a range from -20 °C up to +40 °C.
- ☐ Do not store in direct sunlight or UV light.
- ☐ Do not store aggressive, corrosive substances (solvents / acids / lyes / salts / oils / etc.) near to the brakes.

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

Storage acc. DIN EN 60721-3-1 (including the limitations / additions described above): 1K3; 1Z1; 1B1; 1C2; 1S3; 1M1

Handling

Before installation, the brake must be inspected and found to be in proper condition.

The brake function must be inspected both **once attachment has taken place** as well as **after longer system downtimes**, in order to prevent the drive starting up against possibly seized linings.

Safety Regulations

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

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 using DC-side switching, the coil must be protected by a suitable protection circuit according to VDE 0580, which is integrated in *mayr*®-rectifiers. To protect the switching contact from consumption when using DC-side switching, additional protective measures are necessary (e.g. series connection of switching contacts). The switching contacts used should have a minimum contact opening of 3 mm and should be suitable for inductive load switching. Please make sure on selection that the rated voltage and the rated operating current are sufficient. Depending on the application, the switching contact can also be protected by other protection circuits (e.g. *mayr*®-spark quenching unit, half-wave and bridge rectifiers), although this may of course then alter the switching times.
- ☐ Install additional protective measures **against corrosion** if the brake is subject to extreme ambient conditions or is installed in open air conditions, unprotected from the weather.
- ☐ Take precautions **against freeze-up of the friction surfaces** in high humidity and at low temperatures.

Standards, Directives and Regulations Used and To Be Applied

DIN VDE 0580	Electromagnetic devices and components, general specifications
2014/35/EU	Low Voltage Directive
CSA C22.2 No. 14-2010	Industrial Control Equipment
UL 508 (Edition 17)	Industrial Control Equipment
2014/34/EU	EU Directive on the harmonisation of the laws of the Member States concerning devices and protective systems intended for use in areas where there is a danger of explosion.
EN ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction
DIN EN 61000-6-4	Emission standard for industrial environments
DIN EN 61000-6-2	Immunity for industrial environments
DIN EN 60079-0	Explosive atmospheres - Part 0: Equipment - General requirements
DIN EN 60079-10-1	Explosive atmospheres - Part 10-1: Classification of areas - Explosive gas atmospheres
DIN EN 60079-10-2	Explosive atmospheres - Part 10-2: Classification of areas - Combustible dust atmospheres

DIN EN 60079-14	Explosive atmospheres - Part 14: Electrical installations design, selection and erection
DIN EN 60079-15	Explosive atmospheres - Part 15: Equipment protection by type of protection "n"
DIN EN 60079-17	Explosive atmospheres - Part 17: Electrical installations inspection and maintenance
DIN EN 60079-31	Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"

Liability

The information, guidelines and technical data in these documents were up to date at the time of printing. Demands on previously delivered brakes are not valid.


Liability for damage and operational malfunctions will not be taken if:

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


Guarantee

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

CE Identification

 according to the Low Voltage Directive 2014/35/EU and the ATEX Directive 2014/34/EU

Conformity Markings

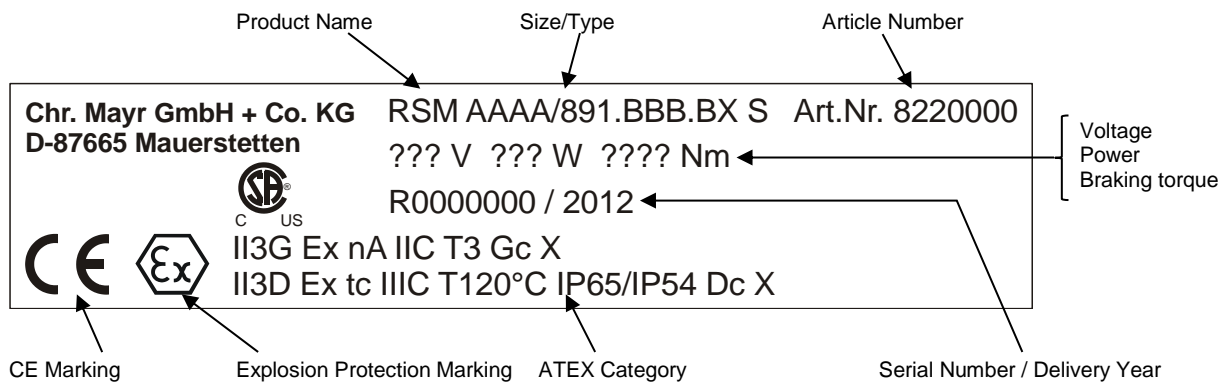
 in terms of the Canadian and American approval

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Identification

mayr® components with ATEX approval are clearly marked and described on the Type tag or engraving:



This marking can also be engraved directly onto the coil carrier (2).

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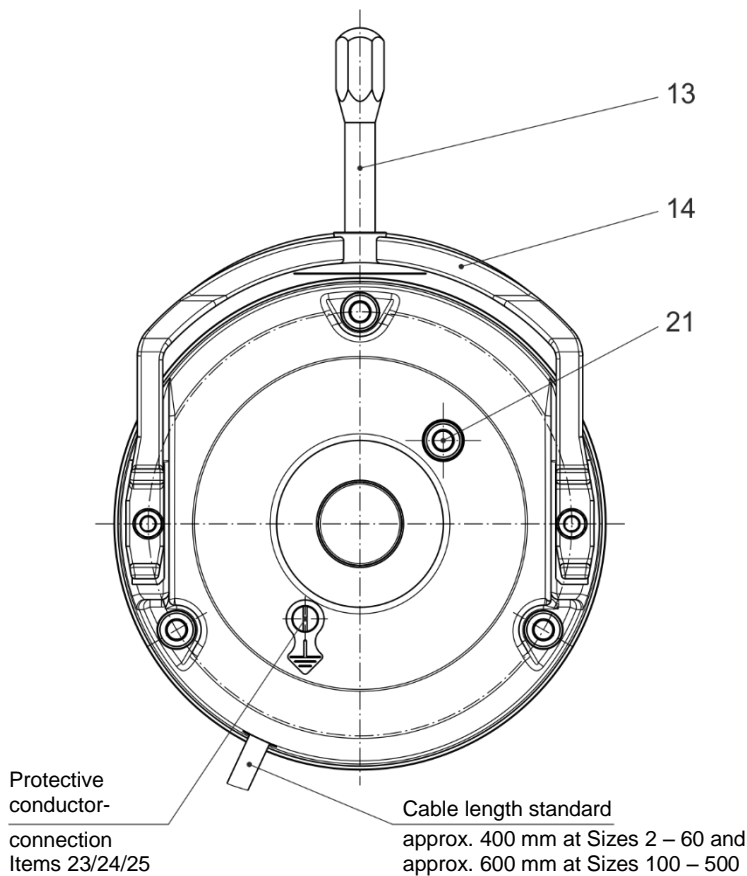


Fig. 1

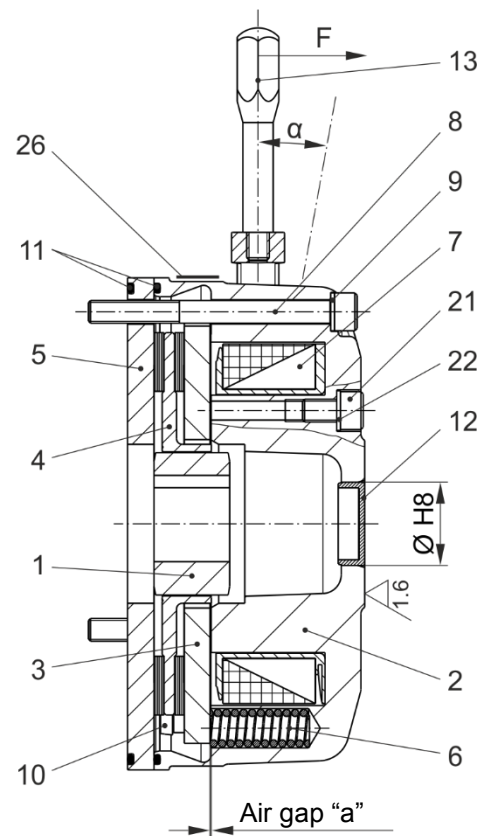


Fig. 2

Parts List (Only use mayr® original parts)

1 Hub	14 Switch bracket
2 Coil carrier with magnetic coil (7)	15 Threaded bolt (see page 12, Fig. 3)
3 Armature disk	16 Thrust spring (hand release; see page 12, Fig. 3)
4 Rotor	17 Hexagon nut (see page 12, Fig. 3)
5 Flange plate	18 Washer (see page 12, Fig. 3)
6 Thrust spring (torque)	19 O-ring (see page 12, Fig. 3)
7 Magnetic coil	20 Intermediate plate (see page 12, Fig. 3)
8 Cap screw	21 Cap screw
9 Bonded seal	22 Copper sealing ring
10 Shoulder screw	23 Cap screw
11 O-ring	24 Contact washer
12 Sealing plug (only for Sizes 8 to 500)	25 Earthing sign
13 Hand release rod	26 Type tag (engraving)

Technical Data (Independent of Size)

Nominal voltages:	24 V / 104 V / 180 V / 207 V
Protection (with hand release):	IP54
Protection (without hand release):	IP65
Duty cycle:	max. 100 %
Max. continuous operating temperature measured on the coil carrier (2):	85 °C
Ambient temperature:	-20 °C up to +40 °C

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Table 1: Technical Data (Dependent on Size)

Sizes	Nominal torque M_2 [Nm]	Max. speed Application field: dust [rpm]	Max. speed Application field: gas [rpm]	P_N Electrical nominal power [W]	Electrical connection Cross-section [mm ²]	Weight [kg]
2	2	3000	3000	19	2 x 0.56	0.76
4	4	3000	3000	25	2 x 0.56	1.1
8	8	3000	3000	29	2 x 0.56	1.8
16	16	3000	3000	38	2 x 0.88	3.4
32	32	3000	3000	46	2 x 0.88	4.5
60	60	3000	1500	69	2 x 0.88	7.4
100	100	3000	1500	88	2 x 0.88	13.6
150	150	1500	1500	98	2 x 0.88	19.2
250	250	1500	1500	120	2 x 0.88	33.3
500	500	750	750	152	2 x 0.88	38

Table 2: Technical Data (Dependent on Size)

Sizes	Mass moment of inertia J Hub + rotor on d_{max} [kgm ²]	Friction work $Q_{r 0.1}$ (per 0.1 mm wear) [J]	Friction work $Q_{r ges.}$ (max. possible friction work in relation to nominal air gap) [J]	Rotor thickness "new" [mm]	Minimum rotor thickness (limit value for braking torque 100 %) [mm]
2	0.12×10^{-4}	4×10^6	10×10^6	6.05	5.8
4	0.21×10^{-4}	8×10^6	20×10^6	6.05	5.8
8	0.67×10^{-4}	14×10^6	35×10^6	6.9	6.65
16	1.74×10^{-4}	20×10^6	100×10^6	8.0	7.5
32	4.48×10^{-4}	27×10^6	135×10^6	10.4	9.9
60	6.74×10^{-4}	29×10^6	159×10^6	11.15	10.6
100	16.54×10^{-4}	39×10^6	234×10^6	14.0	13.4
150	31.68×10^{-4}	47×10^6	282×10^6	15.5	14.9
250	61.82×10^{-4}	59×10^6	354×10^6	17	16.4
500	222.6×10^{-4}	90×10^6	540×10^6	18.5	17.9



Please Observe!

The stated values $Q_{r 0.1}$ and $Q_{r ges.}$ are only reference values
for specific friction work values $< 0.5 \text{ J/mm}^2$ and sliding speeds $< 10 \text{ m/s}$.

Table 3: Technical Data (Dependent on Size)

Sizes	Nominal air gap "a" $+0.1 / -0.05$ (Fig. 5) [mm]	Max. permitted air gap "a" on wear (Fig. 5) [mm]	Inspection dimension "x" (Fig. 3) [mm]	Number of turns "Y" on the hexagon nuts (17) (Fig. 3)
2	0.15	0.4	$0.9^{+0.1}$	1.7
4	0.15	0.4	$0.9^{+0.1}$	1.7
8	0.2	0.45	$1.1^{+0.1}$	1.5
16	0.2	0.7	$1.6^{+0.1}$	2.0
32	0.2	0.7	$1.8^{+0.1}$	2.0
60	0.25	0.8	$2.2^{+0.1}$	2.0
100	0.3	0.9	$2.2^{+0.1}$	1.6
150	0.3	0.9	$2.2^{+0.1}$	1.6
250	0.35	0.95	$2.4^{+0.1}$	1.5
500	$0.4^{+0.15}$	1.0	$2.4^{+0.1}$	1.5

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Table 4: Technical Data (Dependent on Size)

Sizes	Fixing screw Item 8 (Fig. 2) according to DIN EN ISO 4762			Hand release force at nominal torque [N]	Release angle "α" [°]
	For Types 891.0_0.1X and 891.0_1.1X	For Types 891.0_4.1X and 891.0_5.1X	Tightening torque [Nm]		
2	3 x M4 x 45	3 x M4 x 50	2.5	20	6
4	3 x M4 x 45	3 x M4 x 50	2.5	35	7
8	3 x M5 x 50	3 x M5 x 55	5.0	70	7
16	3 x M6 x 60	3 x M6 x 65	9.0	100	7
32	3 x M6 x 60	3 x M6 x 70	9.0	130	8
60	3 x M8 x 75	3 x M8 x 85	22	220	10
100	3 x M8 x 80	3 x M8 x 90	22	260	12
150	3 x M8 x 100	3 x M8 x 110	22	290	13
250	3 x M10 x 110	3 x M10 x 130	45	350	10
500	6 x M10 x 110	6 x M10 x 130	45	310	10

Table 5: Technical Data (Dependent on Size)

Sizes	Min. width of the counter friction surface [mm]	Through hole Ø H8 (Fig. 2) [mm]	Permitted hub bores			
			Keyway – JS9		Keyway – P9	
			DIN 6885/1	DIN 6885/3	DIN 6885/1	DIN 6885/3
2	5	Brake closed	8 – 13	13 – 15	8 – 13	13 – 15
4	6	Brake closed	10 – 13	13 – 15	10 – 13	13 – 15
8	6	22	11 – 18	18 – 20	11 – 18	18 – 20
16	7	22	14 – 22	22 – 25	14 – 20	20 – 22
32	8	28	19 – 30	–	19 – 28	28 – 30
60	8	32	22 – 32	32 – 35	22 – 32	–
100	10	42	24 – 42	42 – 45	24 – 42	42 – 45
150	12	48	30 – 45	45 – 50	30 – 45	45 – 50
250	14	52	40 – 55	55 – 60	40 – 50	50 – 55
500	19	62	50 – 75	75 – 80	50 – 75	75 – 80

Table 6: Technical Data (Dependent on Size)

Sizes	Braking torque (tolerance +40 % / -20 %) [Nm]					Tightening torque shoulder screw Item 10 (Fig. 2) [Nm]
	100 % braking torque Type 891.01_1X	84 % braking torque Type 891.02_1X	68 % braking torque Type 891.03_1X	50 % braking torque Type 891.04_1X	34 % braking torque Type 891.05_1X	
2	2	1.7	1.4	1	0.7	0.5
4	4	3.4	2.8	2	1.4	1.5
8	8	6.8	5.5	4	2.8	2.0
16	16	13.5	11	8	5.5	2.0
32	32	27	22	16	11	2.0
60	60	51	42	30	21	3.5
100	100	85	70	50	35	8.0
150	150	125	100	75	50	8.0
250	250	215	180	125	90	18.5
500	500	400	350	250	200	18.5

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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.

Function

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

Spring applied function (brake):

In de-energised condition, thrust springs (6) press against the armature disk (3). The rotor (4) is held between the armature disk (3) and the flange plate (Item 5 / dependent on Type) or 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

Please check the scope of delivery as well as the state of delivery immediately after receiving the goods.
mayr® will take no responsibility for belated complaints.
Please report transport damage immediately to the deliverer.
Please report incomplete delivery and obvious defects immediately to the manufacturer.

Installation Conditions

- ❑ The eccentricity of the shaft end in relation to the mounting pitch circle must not exceed 0.2 mm.
- ❑ The positional tolerance of the threads for the cap screws (8) must not exceed 0.2 mm.
- ❑ The axial run-out deviation of the screw-on surface to the shaft must not exceed the permitted axial run-out tolerance of **0.08 mm** for Sizes 2 to 8, of **0.1 mm** for Sizes 16 to 250, and of **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 (1) 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 200 °C must not be exceeded.
- ❑ 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.

- ❑ 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 between $R_a = 1.6 \mu\text{m}$ up to $R_a = 3.2 \mu\text{m}$.



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

- ❑ The counter friction surface must be of sufficient thickness (for dimension information, see Table 5). The generated friction temperatures must be effectively conducted from the friction surface onto neighbouring housing components.
The housing components must ensure good temperature radiation into the ambient air.
In limit areas of operation with regard to ambient conditions, friction work and heat dissipation, a temperature monitoring device must be provided on the housing.
- ❑ Dimensioning of the key connection according to the requirements shaft diameter, transmittable torque and operating conditions must be carried out. For this, the corresponding user data must be known or the customer must carry out the dimensioning according to the valid calculation basis DIN 6892.
For the calculation, a hub quality of $R_e = 230 \text{ N/mm}^2$ should be used for sizes 2 and 4 and of $R_e = 300 \text{ N/mm}^2$ should be used for sizes 8 up to 500.
The length of the key should lie over the entire hub.
- ❑ For the dimensioning of the key connections, the permitted tensions common in machine construction must be considered. During initial operation, check whether the key is inserted correctly and whether the brake is secured to the correct tightening torque acc. Table 4.
- ❑ The sealing plug (12) in the coil carrier (2) must be removed on the continuous motor shaft for Sizes 8 – 500, and a suitable radial shaft sealing ring must be inserted.
On Sizes 2 and 4, a suitable turned groove must be added according to the customer specifications at the place of manufacture.
For this, please observe the Guidelines on page 23 for application of the brake in ATEX areas.
- ❑ The ignition protection type "tc, Zone A22" in dusty conditions is achieved via the dust-proof housing and the dust-proof brake installation.
The brake must be secured to the motor bearing plate using a sealing element (e.g. O-ring, Fig. 2, Item 11).
Please observe the guidelines provided by the sealing element manufacturer on static sealing and the guidelines from the standards DIN EN 60079-0 or DIN EN 60079-31.
- ❑ Please abstain from using cleaning agents containing solvents, as they could affect the friction material.
- ❑ Protect the rotor (4) from rusting up / seizing up against the flange surface.
We recommend tried and tested anti-corrosion measures for the mounting surface:
 - dry, oil-free phosphate layers
 - hard chromium and nitriding



Danger of ignition!

Danger of ignition if the Installation Conditions are ignored.

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.0___.1X Sizes 2 – 500

(B.8.1.ATEX.EN)

Installation (Figs. 1 and 2)

1. Mount the hub (1) onto the shaft, bring it into the correct position and secure it axially, e.g. using a locking ring.
2. If necessary (dependent on Type), guide the flange plate (5) with inserted O-ring (Item 11 / please make sure that it is positioned properly) over the shaft and position it onto the machine wall.
Please make sure that the bores in the flange plate (5) and the threaded holes in the machine wall align.
3. Measure the rotor thickness and compare with the values in Table 2. Push the rotor (4) onto the hub (1) by hand (the rotor collar should be facing away from the machine wall or flange plate (5)).
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, install the hand release as described on page 13.
5. Please make sure that the O-ring (11) is inserted properly into the coil carrier (2).
6. Push the rest of the brake over the hub (1) and the rotor collar (4) (the fixing holes should align with the bores on the flange plate (5) or the machine wall).
The shoulder screws (Item 10 / Fig. 2) prevent the individual components from falling apart when the brake is not mounted.
They do not affect the brake function and must not be removed during installation.
7. Secure the brake evenly all around using the cap screws (8) and bonded seals (9) positioned under them **with a torque wrench and a tightening torque acc. Table 4.**



Danger of ignition!

Danger of ignition if the installation instructions are not followed carefully.

Braking Torque Adjustment

The ROBA-stop®-M brakes are set manufacturer-side to the braking torque stipulated on order. Different braking torque adjustments can be made using different spring configurations (6) in the coil carrier (2) (see Table 6). The respective thrust spring set (6) for the requested braking torque adjustment (acc. Table 6) is to be installed at the place of manufacture.
If installation by the user is unavoidable, the required thrust spring set (6) must be ordered stating the exact construction size and braking torque adjustment values.



Attention!

The ATEX brake and Type must be stated.

When determining the brake torque, please take into account that the friction behaviour and therefore the braking torque tolerance is dependent on the interactions between application conditions, ambient conditions and the ageing or wear condition of the synthetic resin bonded friction linings.
In extreme application conditions or in an unfavourable constellation of the application parameters, increased torque tolerances might occur.
Our experience has shown that a tolerance of +40 % / -20 % of the nominal value is to be assumed.

Thrust Springs (6) Replacement

(Attention: The brake must be load-free)



Replacement is only permitted at the place of manufacture or by specially trained personnel.

In order to replace the thrust springs (6), the brake must be unscrewed from the motor bearing shield or from the machine wall.

1. Remove the fixing screws (8).
2. Unscrew the shoulder screws (10) from the coil carrier (2) and remove the armature disk (3).
Attention: The thrust springs (6) press against the armature disk (3). In order to remove the shoulder screws (10), the armature disk (3) must be pressed against the coil carrier (2), if necessary using an auxiliary tool, to avoid immediate relaxation of the thrust springs (6). Observe the installation position of the armature disk (3), or ensure that no thrust springs (6) fall out.

CAUTION



Danger of injury

3. Replace the thrust springs (6).
Attention: Insert the new thrust spring set (6) in symmetrical order.
4. Lay the armature disk (3) onto the coil carrier (2) or the thrust springs (6). Observe installation position (use fixing screws (8) as a centring aid if necessary on Sizes 2 – 60).
5. Press the armature disk (3) down against the spring force, if necessary using an auxiliary tool, and screw in the shoulder screws (10) up to their limits using a tightening torque acc. Table 6.
6. Screw the brake onto the motor bearing shield or the machine wall using fixing screws (8).
Please observe the tightening torque acc. Table 4.
7. Please check that the sealing elements (Items 9 and 11) are positioned properly.



Installation errors lead to **danger of ignition**.

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.0_ _1X Sizes 2 – 500

(B.8.1.ATEX.EN)

Definition of the Braking Torques

Static braking torque

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

Dynamic braking torque

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



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

Braking Torque Adjustment

The ROBA-stop®-M brakes are set manufacturer-side to the braking torque stipulated on order.
When determining the brake torque, please take into account that the friction behaviour and therefore the braking torque tolerance is dependent on the interactions between application conditions, ambient conditions and the ageing or wear condition of the synthetic resin bonded friction linings.
In extreme application conditions or in an unfavourable constellation of the application parameters, increased torque tolerances might occur.
Our experience has shown that a tolerance of +40 % / -20 % of the nominal value is to be assumed.

Run-in Procedure

The stated brake nominal torque is valid for a run-in / conditioned state of the friction lining pairings in standard climate conditions.

- ☐ Please carry out conditioning of the friction lining pairings before initial operation of the system.
- ☐ Please carry out conditioning of the friction lining pairings during operation of the system (see chapter "Maintenance").
- ☐ 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 (22).

→ Inspect the air gaps "a":

Check the air gap "a" (brake de-energised), see page 17.

The nominal air gap "a" acc. Table 3 must be given.

→ Release function inspection

by energising the brake or manually using the hand release (dependent on Type).

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

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.0___.1X Sizes 2 – 500

(B.8.1.ATEX.EN)

Hand Release Installation (Figs. 1, 2 and 3)



Installation is only permitted at the place of manufacture or by specially trained personnel.

CAUTION



For hand release installation, the brake must be dismantled and de-energised.

Procedural Method:

1. Put the thrust springs (16) onto the threaded bolts (15). The threaded bolts (15) come manufacturer-side assembled with a key as tension element and secured with adhesive up to Size M60. This connection must not be loosened.
2. Push the threaded bolts (15) with thrust springs (16) from the inside (you should be facing the magnetic coil (7)) into the hand release bores in the coil carrier (2).
3. Push the O-rings (19) over the threaded bolts (15) and insert them into the coil carrier (2) recesses. Avoid crushing the O-rings (19).
4. Push the intermediate plates (20) over the threaded bolts (15).
5. Mount the switch bracket (14), add the washer (18) and lightly screw on the self-locking hexagon nuts (17).
6. Tighten both hexagon nuts (17) until the armature disk (3) lies evenly against the coil carrier (2).
7. Loosen both hexagon nuts (17) by "Y" turns acc. Table 3, 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.

8. After installing the release cover, screw the hand release rod (13) into the switch bracket (14) and tighten it. The hand release rod (13) must be protected against loosening using a sealing lacquer, e.g. Loctite 243.



Installation errors lead to **danger of ignition**.



Impacts on the hand release mechanism (hand release rod (13) and the switch bracket (14)) can destroy the brake and can lead to **danger of ignition**.

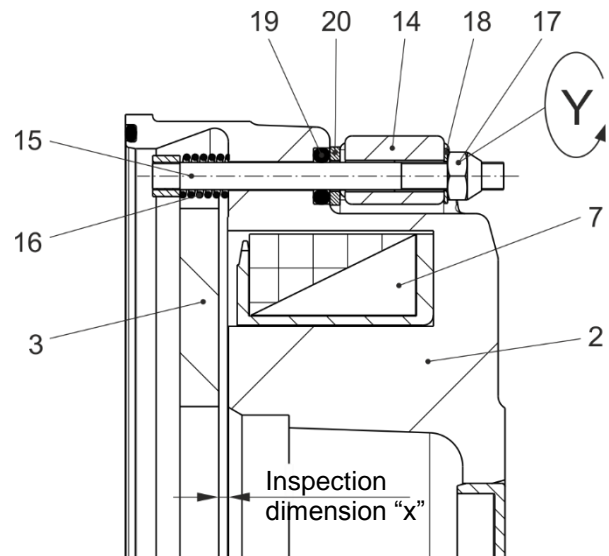


Fig. 3



The inspection dimension "x" (Fig. 3) is only used for hand release adjustment in dismantled condition. The inspection dimension "a" (Figs. 2 and 5) is used for air gap inspection in installed condition.

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.0__1X Sizes 2 – 500

(B.8.1.ATEX.EN)

Torque-Time Diagram

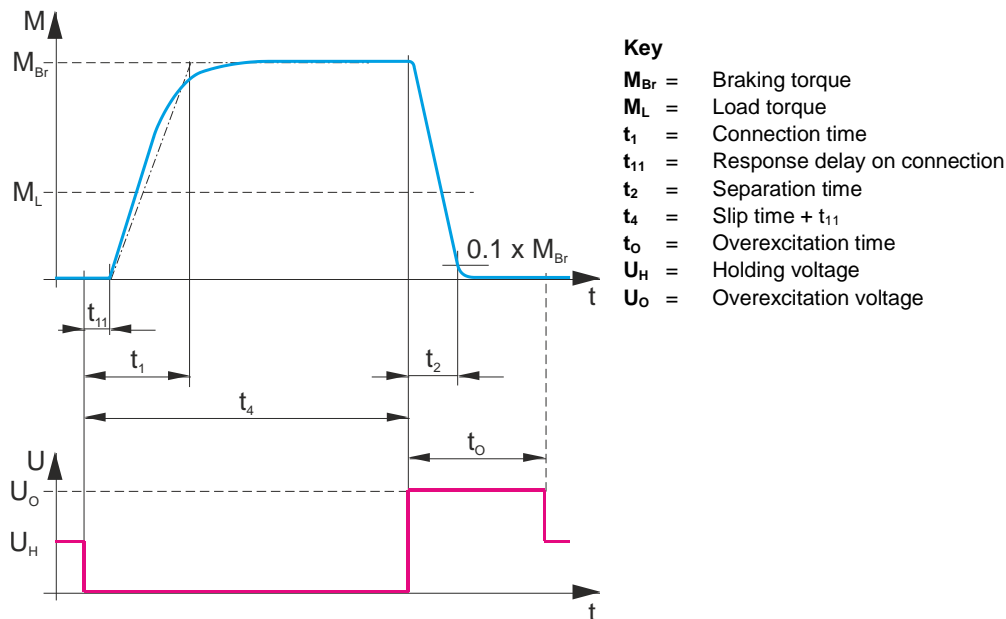


Table 7: Switching Times

Sizes	These values are mean values referring to a nominal air gap and a nominal torque (100 %) on a warm brake. For other braking torque adjustments, please see Table 8.				
	Connection time t_1 (DC switching) [ms]	Connection time t_1 (AC switching) [ms]	Separation time t_2 [ms]	Response delay t_{11} on connection (DC switching) [ms]	Response delay t_{21} on separation [ms]
2	10	100	28	6	4
4	18	160	30	12	5
8	20	220	45	16	6
16	30	320	70	25	12
32	50	400	100	35	20
60	55	500	150	35	23
100	68	640	180	38	25
150	80	730	220	40	30
250	100	1100	290	50	35
500	100	1100	400	30	50

Table 8: Switching Times

Separation time t_2 and overexcitation time t_o dependent on the braking torque adjustment (spring configuration)															
Sizes	100 % braking torque Type 891.01__1X			84 % braking torque Type 891.02__1X			68 % braking torque Type 891.03__1X			50 % braking torque Type 891.04__1X			34 % braking torque Type 891.05__1X		
	M_2 [Nm]	t_2 [ms]	t_o [ms]	M [Nm]	t_2 [ms]	t_o [ms]	M [Nm]	t_2 [ms]	t_o [ms]	M [Nm]	t_2 [ms]	t_o [ms]	M [Nm]	t_2 [ms]	t_o [ms]
2	2	28	56	1.7	25	50	1.4	21	43	1	17	35	0.7	14	28
4	4	30	60	3.4	26	53	2.8	23	46	2	19	38	1.4	15	30
8	8	45	90	6.8	40	80	5.5	34	68	4	28	56	2.8	22.5	45
16	16	70	140	13.5	62	124	11	53	106	8	43	87	5.5	35	70
32	32	100	200	27	88	176	22	76	152	16	62	124	11	50	100
60	60	150	300	51	132	264	42	114	228	30	93	186	21	75	150
100	100	180	360	85	158	317	70	137	274	50	112	224	35	90	180
150	150	220	440	150	194	388	125	167	334	100	136	273	75	110	220
250	250	290	580	215	255	510	180	220	441	125	180	360	90	145	290
500	500	400	800	400	352	704	350	304	608	250	248	496	200	200	400

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.0___.1X Sizes 2 – 500

(B.8.1.ATEX.EN)

Electrical Connection and Wiring

DC current is necessary for operation of the brake. The coil voltage is indicated on the Type tag as well as on the brake body and is designed according to the DIN IEC 60038 ($\pm 10\%$ tolerance). Operation can take place with alternating voltage using a rectifier or another suitable DC power supply. The connection possibilities can vary dependent on the brake equipment. Please follow the exact connections according to the Wiring Diagram. The manufacturer and the user must observe the applicable regulations and standards (e.g. DIN EN 60204-1 and DIN VDE 0580). Their observance must be guaranteed and double-checked!



The brake connection cable is designed with free cable ends. The cable must be inserted into a suitable terminal box via a cable gland with strain relief according to the ATEX directive. The designation "X" after the ATEX classification refers to the measures required for clamping the free line ends acc. the ATEX directive.

Earthing 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. In order to guarantee this, a threaded hole for an earthing connection is provided on the coil carrier (2). If the basic insulation fails, no contact voltage will remain. Please carry out a standardised inspection of the protective conductor connections to all contactable metal parts!

Device Fuses

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

Switching Behaviour

The reliable operational behaviour of a brake is to a large extent dependent on the switching mode used. Furthermore, the switching times are influenced by the temperature and the air gap between the armature disk (3) and the coil carrier (2) (dependent on the wear condition of the linings). In order to switch the brake, switching contacts in the usage category AC-3 acc. EN 60947-4-1 must be used.

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 (3) to the coil carrier (2) and releases the brake.

Field Build-up with Normal Excitation

If the magnetic coil (7) is energised with nominal voltage using a half-wave or bridge rectifier, 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 / Fig. 4) 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 / Fig. 4). The relationship between overexcitation and separation time t_2 is roughly indirectly proportional, meaning that at doubled nominal voltage the separation time t_2 for release of the brake is halved. The ROBA®-switch fast acting rectifier and phase demodulator work on this principle.

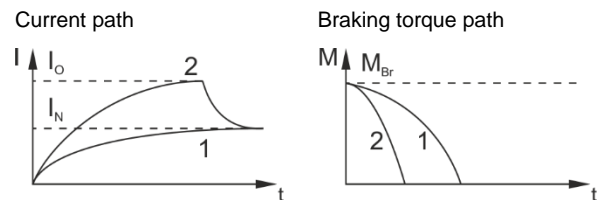


Fig. 4



Attention! ROBA®-switch fast-acting rectifiers and phase demodulators are not suitable for use in areas where there is a danger of explosion.

It is possible to mount such rectifiers in a control cabinet outside the area where there is a danger of explosion.

Operation with overexcitation requires an inspection of:

- the required overexcitation time*
- as well as the RMS coil capacity** with a cycle frequency higher than 1 cycle per minute.

* Overexcitation time t_o

Increased wear, and therefore an increasing air gap as well as coil heating lengthen the separation times t_2 for the brake. For this reason, at least double the separation time t_2 at nominal voltage must be selected as overexcitation time t_o on each brake size (see Table 7 on page 14).

The spring forces also influence the brake separation times t_2 : Higher spring forces increase the separation times t_2 and lower spring forces reduce the separation times t_2 .

The changes in the separation times t_2 due to the spring configuration (braking torque adjustment) can be seen in Table 8 on page 14.

** RMS coil capacity P



$P \leq P_N$

The coil capacity P must not be larger than P_N . Otherwise the coil may fail due to thermic overload.

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.0__1X Sizes 2 – 500

(B.8.1.ATEX.EN)

Key and Calculations:

P [W] RMS coil capacity dependent on switching frequency, overexcitation, reduction in capacity and duty cycle

$$P = \frac{P_O \times t_O + P_H \times t_H}{T}$$

P_N [W] Coil nominal capacity (catalogue values, Type tag)

P_O [W] Coil capacity on overexcitation

$$P_O = \left(\frac{U_O}{U_N}\right)^2 \times P_N$$

P_H [W] Coil capacity at reduced capacity

$$P_H = \left(\frac{U_H}{U_N}\right)^2 \times P_N$$

t_O [s] Overexcitation time

t_H [s] Time of operation with reduction in capacity

t_{on} [s] Time with voltage

t_{off} [s] Time without voltage

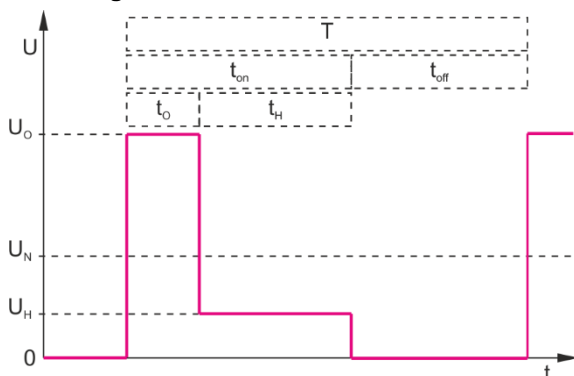
T [s] Total time (t_O + t_H + t_{off})

U_O [V] Overexcitation voltage (bridge voltage)

U_H [V] Holding voltage (half-wave voltage)

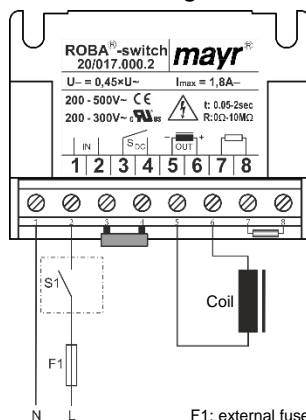
U_N [V] Coil nominal voltage

Time Diagram



Magnetic Field Removal

AC-side Switching

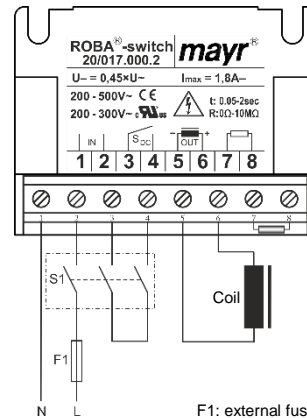


The power circuit is interrupted in front of the rectifier. The magnetic field slowly reduces. This delays the rise in braking torque.

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

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

DC-side Switching



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

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

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

Protection Circuit

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



Attention!

mayr®-spark quenching units, half-wave and bridge rectifiers are **not suitable** for use in areas where there is a danger of explosion.

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.0__1X Sizes 2 – 500

(B.8.1.ATEX.EN)

Air Gap Inspection

The air gap can be determined by removing the cap screw (21) including the copper sealing ring (22) and then measuring dimension "z" (Fig. 5) once in energised and once in de-energised condition.

$$\Rightarrow Z_{\text{de-energised}} - Z_{\text{energised}} = \text{Air gap "a"}$$

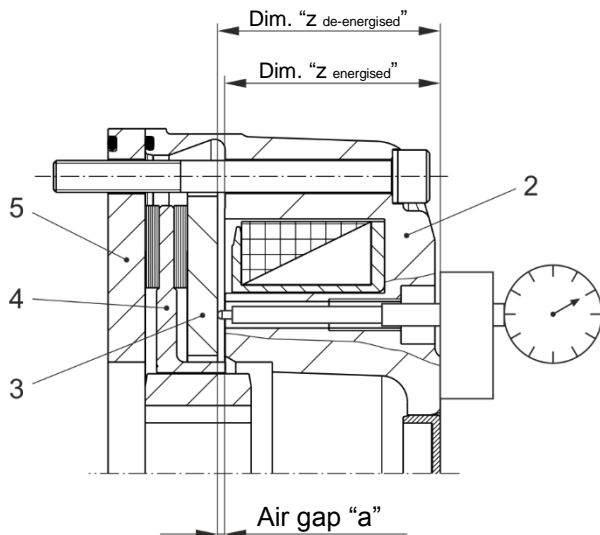


Fig. 5

Maintenance

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

ROBA-stop®-M brakes are mainly maintenance-free. The friction lining pairing is robust and wear-resistant. This ensures a particularly long service lifetime of the brake.

The friction lining is subject to functional wear in case of **EMERGENCY STOP** and during regular conditioning of the friction lining pairing.

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 3.
- ☐ Measuring the rotor thickness on the dismantled brake.
See Table 2 for the minimum rotor thickness.



Attention!

The maximum air gap "a", see Table 3, must not be exceeded.
If the measured maximum air gap "a" lies above the Table value, the rotor (4) must be replaced.
Please ensure that the counter friction surface is of the correct quality. If the friction surface is not of the quality described, replace the armature disk (3) and the flange plate (5), too.

We recommend the following regular inspection intervals:

Twice a year or after 1000 operating hours

- Inspection of the rotor thickness (wear)
- Inspection of the toothings of the rotor (4) and the hub (1) for moves easily, increased backlash and damage. The max. permitted rotor torsional backlash on the hub, Sizes M2 – M32 → 0.5°, Sizes M60 – M500 → 0.3°. Inspection on an engaged brake and load-free output by turning the motor shaft.
- Check the armature disk (3) and the counter friction surface for signs of wear and plane parallelism (on Sizes 2 to 60: 0.03 mm, on Sizes 100 to 500: 0.05 mm). There must be no excessive formation of grooves. If necessary, replace the armature disk (3) and the flange plate (5).
Please observe the section "Replacing the Rotor" on page 18.
- Remove any layers of dust on the brake.
- Clean the brake.

Replacement of the rotor

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

User-implemented determination

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

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

If regular brake conditioning in holding applications is not possible, a higher level of security must be used for dimensioning. (Recommendation: $S_i = 2.0 \Rightarrow$ 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.



Unpermitted wear can cause a change in the brake braking and release behaviour, resulting in a substantial **danger of ignition**.



Attention!

Before the brake is removed from the bearing shield, the parts inside the brake must have cooled down so that there is no danger of ignition or of injury. This is achieved by leaving the brake shut down for half an hour, de-energised, between the last braking action and de-installation.

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.0___.1X Sizes 2 – 500

(B.8.1.ATEX.EN)

Replacing the Rotor (4)

Before replacing the rotor (4)

- ☐ Clean the brake.



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

- ☐ Measure the rotor thickness of the new rotor.
The nominal dimension acc. Table 2 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 motor bearing shield or from the machine wall.

Replace the rotors (4) by following the Brake Installation instructions backwards.

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

- 1) Unscrew the shoulder screws (10) from the coil carrier (2) and remove the armature disk (3).
Attention: The thrust springs (6) press against the armature disk (3). In order to remove the shoulder screws (10), the armature disk (3) must be pressed against the coil carrier (2), if necessary using an auxiliary tool, to avoid immediate relaxation of the thrust springs (6). Observe the installation position of the armature disk (3), or ensure that no thrust springs (6) fall out.

CAUTION



Danger of injury.

- 2) Lay the new armature disk (3) onto the coil carrier (2) or the thrust springs (6). Observe installation position (use fixing screws (8) as a centring aid if necessary on Sizes 2 – 60).
- 3) Press the armature disk (3) down against the spring force, if necessary using an auxiliary tool, and screw in the shoulder screws (10) up to their limits using a tightening torque acc. Table 6.

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

Information on the Components

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

Possible hazards:

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

Classification: Hazardous property
Attention: H-classification: H372



Protective measures and rules of behaviour:

Do not inhale dusts

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

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

Additional information:

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

Cleaning the Brake



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

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

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.0___.1X Sizes 2 – 500

(B.8.1.ATEX.EN)

Permitted Brake Friction Work

The permitted friction work values dependent on the switching frequency shown in the characteristic curves (pages 20 to 22) must not be exceeded, not even in EMERGENCY STOP operation.



Danger of ignition!

If the maximum friction work is exceeded and/or at increased switching frequency.

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.

The max. permitted continuous operating temperature for the brake core is 100 °C.

The core temperature of the magnetic coil (7) in energised condition is higher than the exterior temperature of the brake. So that the core temperature of 100 °C is not exceeded, a max. exterior temperature on the coil carrier (2) of 85 °C (without layers of dust / temporary 110 °C) is permitted and must be checked by taking measurements.

The max. temperatures are acc. DIN EN 60079-14 only permitted for dust deposits < 5 mm.

Example (application field dust):

The rated speed is 1500 rpm, and a brake Size 16 is used. At 100 switchings per hour, the permitted friction work per switching is approx. 2000 J (see page 21, Diagram 4).



Dust Atmosphere:

A temperature monitoring device must be mounted onto the brake coil carrier (2) if during the function sequence of the brake application it cannot be guaranteed that the friction work values and switching frequencies defined in the Installation and Operational Instructions are observed.



Gas Atmosphere:

The temperature generated and relevant for a possible danger of ignition cannot be measured on the brake using a temperature monitoring system, as this temperature is only produced temporarily between the friction surfaces during the brake procedure. This temperature represents a potential danger of ignition in gas atmosphere. The defined friction work values and switching frequencies for gas must not under any circumstances be exceeded, even if the brake exterior temperature lies well below the max. permitted surface temperature. If it cannot be guaranteed during function of the brake application that the max. permitted friction work values and switching frequencies are maintained, this brake must not be used.

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 / ROBA®-switch / Microswitch):

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

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

Steel scrap (Code No. 160117)

All aluminium components:

Non-ferrous metals (Code No. 160118)

Brake rotor (steel or aluminium pads with friction linings):

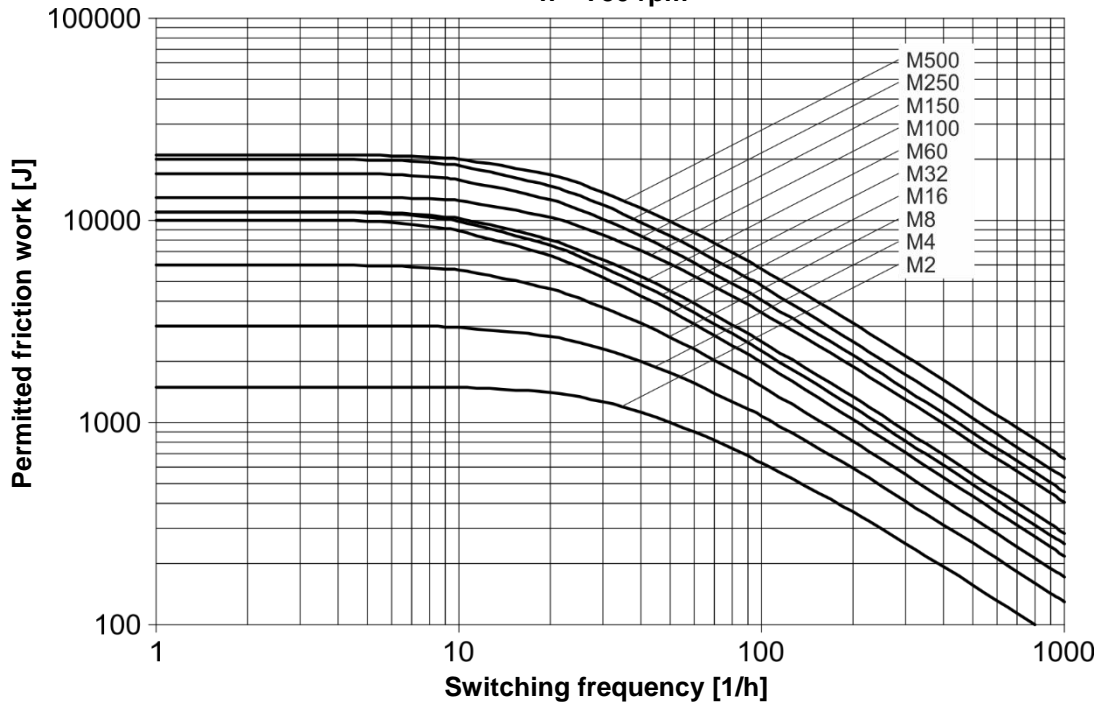
Brake linings (Code No. 160112)

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

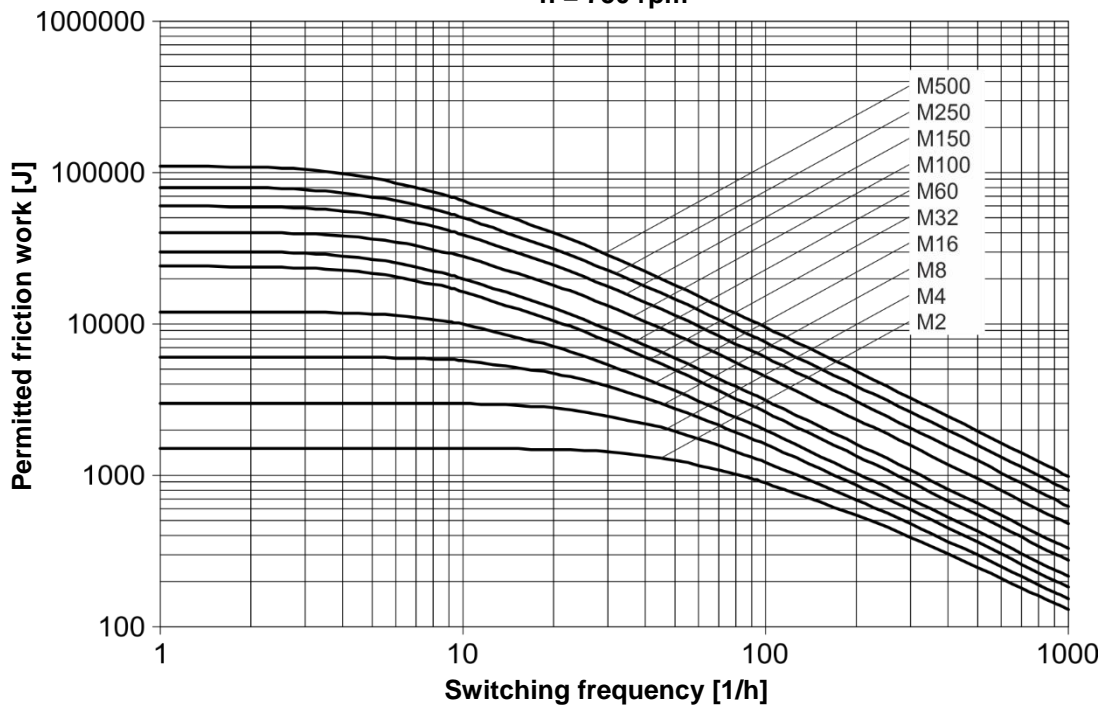
Plastic (Code No. 160119)

Friction Power Diagrams

Friction Power Diagram 1
Application Field: Gas
n = 750 rpm

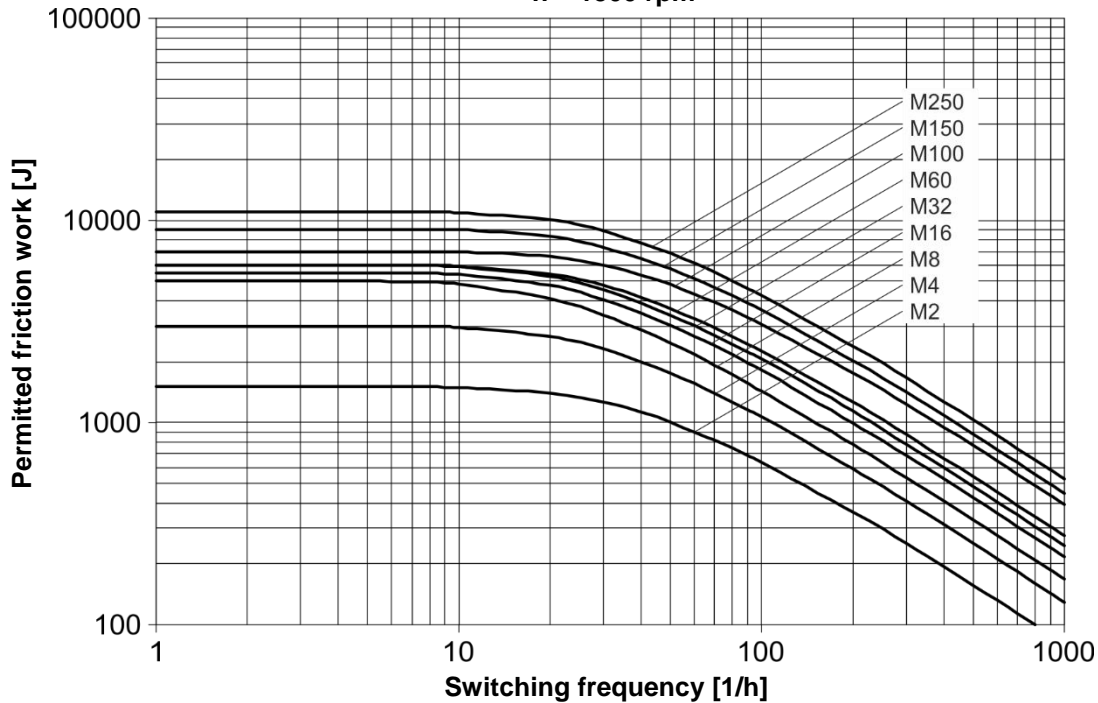


Friction Power Diagram 2
Application Field: Dust
n = 750 rpm

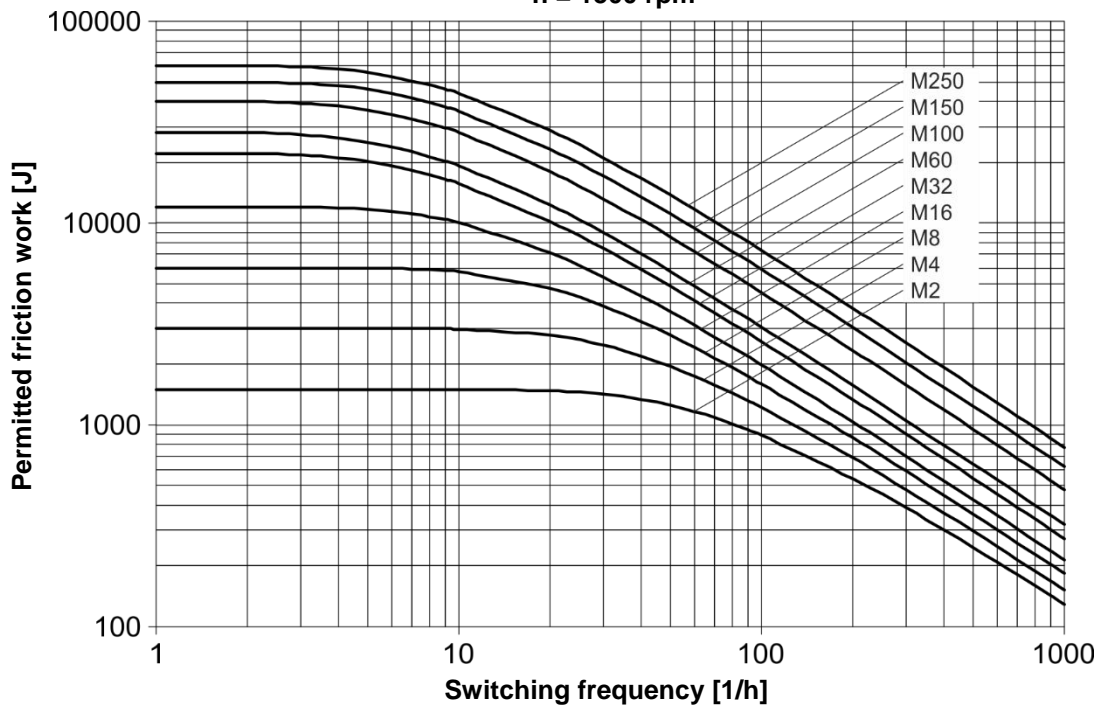


Friction Power Diagrams

**Friction Power Diagram 3
Application Field: Gas
n = 1500 rpm**

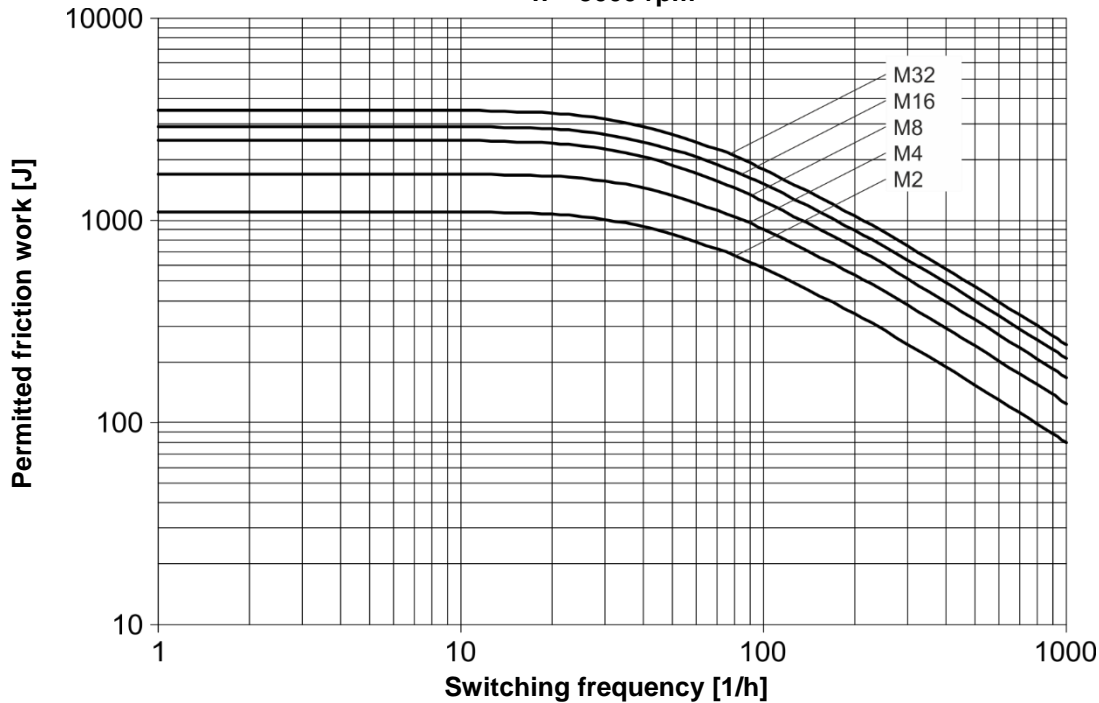


**Friction Power Diagram 4
Application Field: Dust
n = 1500 rpm**

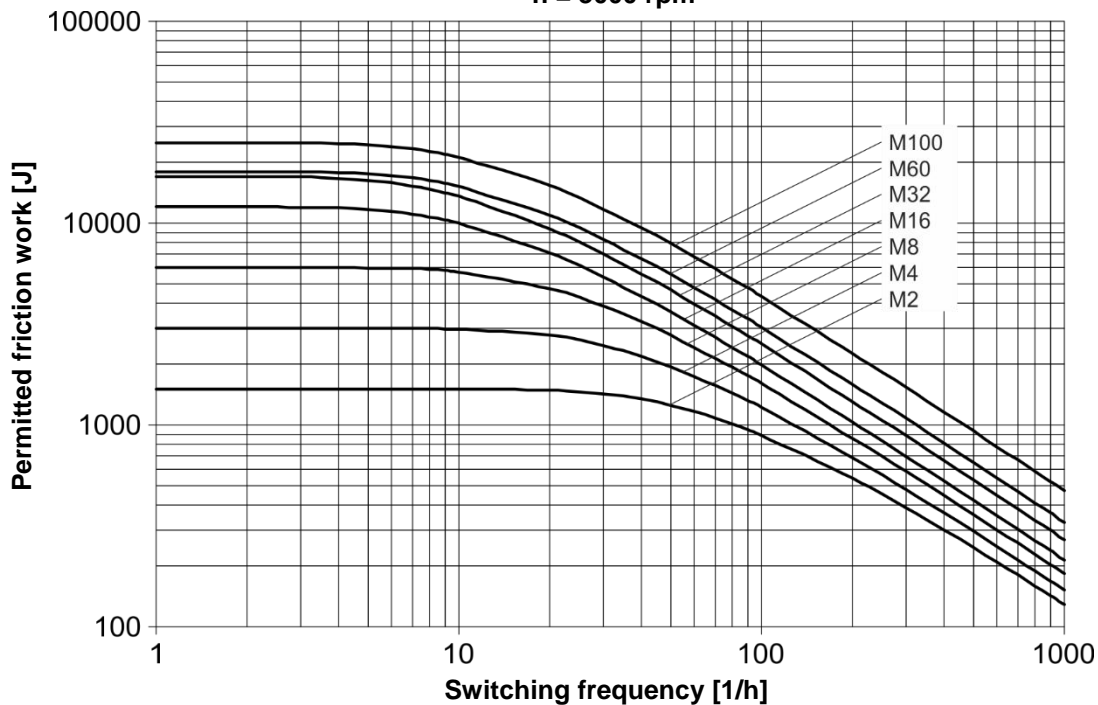


Friction Power Diagrams

**Friction Power Diagram 5
Application Field: Gas
n = 3000 rpm**



**Friction Power Diagram 6
Application Field: Dust
n = 3000 rpm**





Installation and Operational Instructions for ROBA-stop®-M brake Type 891.0_ _1X Sizes 2 – 500

(B.8.1.ATEX.EN)

Guidelines and Directives for Operation in Areas Where There is a Danger of Explosion

Classification of Areas Where There is a Danger of Explosion and Permitted Types

If the measures and guidelines described in the Installation and Operational Instructions are observed, the ROBA-stop®-M brake is suitable for use in areas where there is a danger of explosion according to the category:

  II3G Ex nA IIC T3 Gc X
II3D Ex tc IIIC T120°C IP65/IP54 Dc X

Permitted Types: 891.010.1X

891.011.1X
891.014.1X
891.015.1X
891.020.1X
891.021.1X
891.024.1X
891.025.1X
891.030.1X
891.031.1X
891.034.1X
891.035.1X
891.040.1X
891.041.1X
891.044.1X
891.045.1X
891.050.1X
891.051.1X
891.054.1X
891.055.1X

Mounting the brake onto a system with a shaft guided through the brake is permitted.

For this, the sealing plug (12) must be removed and a suitable sealing element must be inserted between the shaft provided by the operator and the coil carrier (2).

The bore quality of the coil carrier is stated in Table 5. The surface quality of the coil carrier end face is $R_a = 1.6 \mu\text{m}$. If these connection geometries cannot be used, suitable special turned grooves must be made at the site of manufacture.

Attention: Dust must be prevented from entering the brake.

Protection IP54 must be guaranteed.

No unpermittedly high temperatures must be generated by the sealing element due to friction. The resulting temperature at the sealing point must be inspected during initial operation.

Sizes 2 and 4 are designed without through holes.

Initial Operation in Areas Where There is a Danger of Explosion

For malfunction-free brake operation, it is necessary to keep to the brake characteristic values (Technical Data) indicated on pages 7 to 9 and the Friction Power Diagrams on pages 20 to 22. The brake must be dimensioned according to the application. The Dimensions Tables in Catalogue K.891.V_ must be observed.

CAUTION



Operation outside of the indicated characteristic data is not permitted. There is a danger of brake destruction and of ignition.

When the brake is delivered, it must be checked for ATEX-conform labelling according to the application area for which it is intended; for alignment of the order information; for completeness and for any transport damage. Damage to the cable insulation in particular will lead to **danger of ignition**.

The functional capability and the correct dimensioning of the brake must be ensured and confirmed during initial operation. Furthermore, the device must be inspected for correct function with the components within the system such as the motor, control unit, inertia of masses and possible loads. For application at the maximum performance limits of the brake, the max. continuous operating temperature for the intended load (exterior, measured on the brake coil carrier (2)) of 85 °C (temporarily 110 °C) must be checked. The wear condition of the brake and the toothing backlash must be inspected at regular intervals. Please observe the section "Maintenance", page 17. It is expedient to make the inspection intervals shorter during the first period after initial operation; should the inspection results prove positive, the inspection intervals can then be extended accordingly (e.g. 2 days, 2 weeks, 2 months, after positive wear condition half-yearly or after 1000 operating hours).

The free axial mobility of the brake rotor (4) on the hub toothing (1) must be ensured and checked.

The values $Q_{r0.1}$ and $Q_{r\text{ges}}$ stated in Table 3 are only approximate values for specific friction work values $< 0.5 \text{ J/mm}^2$ and sliding speeds $< 10 \text{ m/s}$.

During operating conditions with higher specific loads, the wear values can increase dramatically. The wear condition of the brake can be measured through the inspection opening in the coil carrier (2), see section "Air Gap Inspection" on page 17.

In limit areas of operation with regard to ambient conditions, friction work and heat dissipation, a temperature monitoring device must be provided on the coil carrier (2).

When mounting the brake or during installation work, the guidelines, tightening torques and dimension information given in the Installation and Operational Instructions must be observed.

Attention: Danger of ignition

An uneven adjustment dimension on the hand release can cause the brake to malfunction.

Attention: Danger of ignition

There is a **danger of ignition** if the brake is electrically wired deviating from the measures described.

Guidelines and Directives for Operation in Areas Where There is a Danger of Explosion

Dangerous Operating Conditions in Areas Where There is a Danger of Explosion

If the rotor (4) becomes excessively worn, the brake coil is no longer able to attract the armature disk (3) against the spring force and release the brake. Furthermore, the braking torque drops during this wear condition as the thrust springs (6) relax. This unpermitted operating condition could cause unnoticed permanent grinding on the brake or cause a load to drop.

Attention: Danger of ignition, danger of injury

The control bore on the brake can be used to inspect the brake air gap or the wear condition. During initial operation, the required air gap dimensions "a" must be checked. Attention: If the air gap is too small, changes in operating conditions, e.g. temperature expansion, swelling of friction linings or layers of abraded particles will cause the rotor to grind.

Attention: Danger of ignition

Continuous grinding of the rotor (4), independent of the defined friction work dependent on the switching frequency, leads to excessive wear on the friction linings.

Attention: Danger of ignition

Abraded metal particles are attracted to the magnetic coil and can lead to malfunctions, impairing the brake release behaviour.

Attention: Danger of ignition

Operating conditions which cause friction work independent of the brake dimensioning must be avoided or taken into account during dimensioning. If the motor starts up against the closed brake, this will be placed under strain accordingly.

Attention: Danger of ignition

Due to the brake switching times, the drive can be accelerated by a load or a load torque when the motor is switched off. This means that the brake is subjected to a higher level of friction work during the brake procedure than may be intended in terms of dimensioning.

Attention: Danger of ignition

During motor braking procedures, there is a risk of the brake having to take on part of the motor braking work due to incorrect wiring, meaning that it is subjected to a higher load than intended in terms of dimensioning.

Attention: Danger of ignition

Ambient influences, long downtimes and condensation inside the brake due to temperature fluctuations and corrosion change the friction behaviour on the friction linings and therefore the braking torque. In extreme cases, the friction linings can stick, corrode up or freeze up. The brake must be protected from damaging ambient influences. The braking torque must be inspected at regular intervals.

Attention: Danger of ignition

Different operating conditions, particularly strong oscillations, vibrations and different sliding speeds will change the braking behaviour of the brake. Oscillations and vibrations during the braking procedure, which are often indicated by squeaking, can lead to wear on the rotor (4) and to the rotor toothing being knocked out. Regular inspection of the rotor wear and the toothing backlash between the rotor (4) and the hub (1) is required in order to inspect the wear condition of the brake.

Attention: Danger of ignition

Changes to the system operating parameters such as speeds, inertia of masses, cycle frequencies and load torques change the load on the brake during braking procedures. If these parameters are changed in the system, the brake must be re-dimensioned.

Attention: Danger of ignition

Impacts on the brake components and the brake hand release can destroy these components.

Attention: Danger of ignition

Metal components grinding against or impacting brakes will lead to spark formation or heating and therefore to **danger of ignition**. Components made of aluminium or rusty parts represent a particularly high risk potential. Covering material made of stainless steel can minimise this risk. Operator mounting parts such as covers, fans etc. must be mounted maintaining sufficient distance to the brake in order to avoid potential sparks caused by contact between the metals, for example due to chafing caused by vibrations.

Rotating or moving parts must be protected against impacts from objects.


Attention: Danger of ignition

During installation or de-installation and re-installation, please ensure that the sealing elements provided are installed correctly. For the ROBA-stop®-M brake in areas where there is a danger of explosion, at least IP Protection 54 is provided. Layers of dust inside the brake lead to a **danger of ignition**.

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.0___.1X Sizes 2 – 500

(B.8.1.ATEX.EN)


Malfunctions / Breakdowns

Malfunction	Result of Malfunction	Possible Causes	Danger Guidelines for  Areas	Solutions <input type="checkbox"/> The brake must always be dismantled in order to remove damage and malfunctions. <input type="checkbox"/> Damaged parts must be replaced in order to solve the respective problem. <input type="checkbox"/> The brake must be cleaned before re-installation.
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	Danger of ignition	Check tolerances
		Tolerance errors on the key connection	Danger of ignition	
		Broken hub due to installation error when mounting	Danger of ignition	Suitable mounting method
		Poor shaft quality	Danger of ignition	Check the shaft quality
		Poor key dimensioning	Danger of ignition	Carry out a key calculation
		Hub toothing dirty due to abraded or worn particles	Danger of ignition	Check the hub and rotor toothing; maintain suitable maintenance intervals
		Worn, knocked out hub and rotor toothing	Danger of ignition	
		Toothings breakage	Danger of ignition	
		Damaged / deformed hub and rotor toothing	Danger of ignition	
Attention: During installation and/or initial operation, the free axial mobility of the rotor must be checked; a clamped rotor means danger of ignition				
The brake does not release completely; permanent grinding of the rotor	Wiring error on the brake	Incorrect voltage; no DC voltage	Danger of ignition	Check voltage, observe the wiring guidelines
		Defective electrical wiring	Danger of ignition	Check electrical wiring
		Defective coil, coil is electrically or thermally overloaded	Danger of ignition	Check coil capacity; check insulation resistance
Attention: Incorrect electrical wiring of the brake means danger of ignition				
The brake does not release completely; permanent grinding of the rotor	Air gap too small in released condition	Due to installation	Danger of ignition	Air gap inspection
		Penetration of foreign bodies into the brake, in particular magnetisable particles	Danger of ignition	Check the brake interior for dirt and clean it
		Excessive component temperatures; temperature expansion	Danger of ignition	Temperature inspection

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.0___.1X Sizes 2 – 500

(B.8.1.ATEX.EN)


Malfunctions / Breakdowns

Malfunction	Result of Malfunction	Possible Causes	Danger Guidelines for  Areas	Solutions <input type="checkbox"/> The brake must always be dismantled in order to remove damage and malfunctions. <input type="checkbox"/> Damaged parts must be replaced in order to solve the respective problem. <input type="checkbox"/> The brake must be cleaned before re-installation.
Slipping; permanent grinding of the brake under load; increase in friction work	Braking torque too low	Incorrect dimensioning	Danger of ignition	Check the required braking torque
		Incorrect spring configuration	Danger of ignition	Check the spring configuration; have the brake checked at the place of manufacture
	Drop in braking torque	Excessive wear on the rotor	Danger of ignition	Wear inspection
		Changes to the friction behaviour on the friction lining due to the maximum sliding speed being exceeded	Danger of ignition	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	Danger of ignition	Check for correct wiring, switching times and dimensioning
		Corrosion on the counter friction surface	Danger of ignition	Check the brake for corrosion
		Ambient influences, oil, water, cleaning media, condensation formation	Danger of ignition	Check protection against environmental influences
		Type and quality of the counter friction surface	Danger of ignition	Check the counter friction surface
		Extremely low friction speeds	Danger of ignition	Check the dimensioning
	Brake cannot be released	Excessive tension path due to unpermitted wear	Danger of ignition	Wear inspection; replace the rotor
		No voltage connection	Danger of ignition	Check the voltage connection
Increased friction work; brake grinds	Excessively long engagement times	Load accelerates the drive line during the brake engagement time	Danger of ignition	Check for correct wiring, switching times and dimensioning
	Drop in braking torque	Excessive wear on the rotor	Danger of ignition	Wear inspection; replace the rotor
	Motor starts up against closed brake	Excessive brake attraction times	Danger of ignition	Check for correct wiring, switching times; check dimensioning; check motor controls

Installation and Operational Instructions for ROBA-stop®-M brake Type 891.0_ _1X Sizes 2 – 500

(B.8.1.ATEX.EN)

Malfunctions / Breakdowns

Malfunction	Result of Malfunction	Possible Causes	Danger Guidelines for  Areas	Solutions <input type="checkbox"/> The brake must always be dismantled in order to remove damage and malfunctions. <input type="checkbox"/> Damaged parts must be replaced in order to solve the respective problem. <input type="checkbox"/> The brake must be cleaned before re-installation.
Component breakage	Operating conditions	Oscillations, vibrations, overload, unpermittedly high speeds	Danger of ignition	Check operating conditions and dimensioning
	Ambient influences, temperature, fluids, media, corrosion	Friction linings sticking, settling or swelling; changes in friction lining friction behaviour	Danger of ignition	Check protection against environmental influences
	Deviations, adjustment dimensions, screw tightening torques	Brake securement, hand release, actuation lever, screws	Danger of ignition	Check the guidelines and values according to the information in the Installation and Operational Instructions
Unpermittedly high surface temperatures on the brake	Unpermittedly high friction work, switching frequency "dust atmosphere"	Deviations from the defined permitted friction power curves "dust"	Danger of ignition	Check dimensioning; measure the temperature on the brake; check the actual friction work and the switching frequency.
	Unpermittedly high coil overexcitation times	Deviations from the defined permitted overexcitation times	Danger of ignition	Check the brake wiring; measure the temperature on the brake; check the actual overexcitation times
	Unpermittedly high friction work, switching frequency "gas atmosphere"	Deviations from the defined permitted friction power curves "gas"	Danger of ignition	Attention: The temperature generated and relevant for a possible danger of ignition cannot be measured on the brake, as this temperature is only produced temporarily between the friction surfaces until the brake is released. This temperature represents a potential danger of ignition in gas atmosphere. The defined friction work values and switching frequencies for gas must not under any circumstances be exceeded, even if the brake exterior temperature lies well below the max. permitted surface temperature.
	Defective coil	Shorted coil; earth short-circuit	Danger of ignition	Check coil capacity; check insulation resistance; have the brake inspected at the place of manufacture
	Wiring error on the brake	No voltage applied	Danger of ignition	Check the brake wiring

Declaration of Conformity

According to the EU Directive on the harmonisation of the laws of the Member States concerning devices and protective systems intended for use in areas where there is a danger of explosion (ATEX) 2014/34/EU, we:

**Chr. Mayr GmbH + Co. KG
Eichenstraße 1
D-87665 Mauerstetten**

hereby declare that the product described in these Installation and Operational Instructions

**ROBA-stop®-M brake
Type 891.0___.1X
Sizes 2, 4, 8, 16, 32, 60, 100, 150, 250, 500**

has been developed, constructed and produced by us in accordance with the EU Directive named above.

Applied Standards, Regulations and Inspections (ASRI)

- 1 DIN EN 1127-1: 2011
Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology
- 2 DIN EN 60079-0: 2012
Explosive atmospheres - Part 0: Equipment - General requirements
- 3 DIN EN 60079-15: 2010
Explosive atmospheres - Part 15: Equipment protection by type of protection "n"
- 4 DIN EN 60079-31: 2014
Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"

Mauerstetten, September 28, 2018
Place / Date


Graduate Engineer (FH, University of Applied
Science) Günther Klingler
(Managing Director ppa.)