Safety Brake for

Brake Motors
Invalid carriages
Automation Systems

ROBA-stop®-M

Electromagnetic safety brake

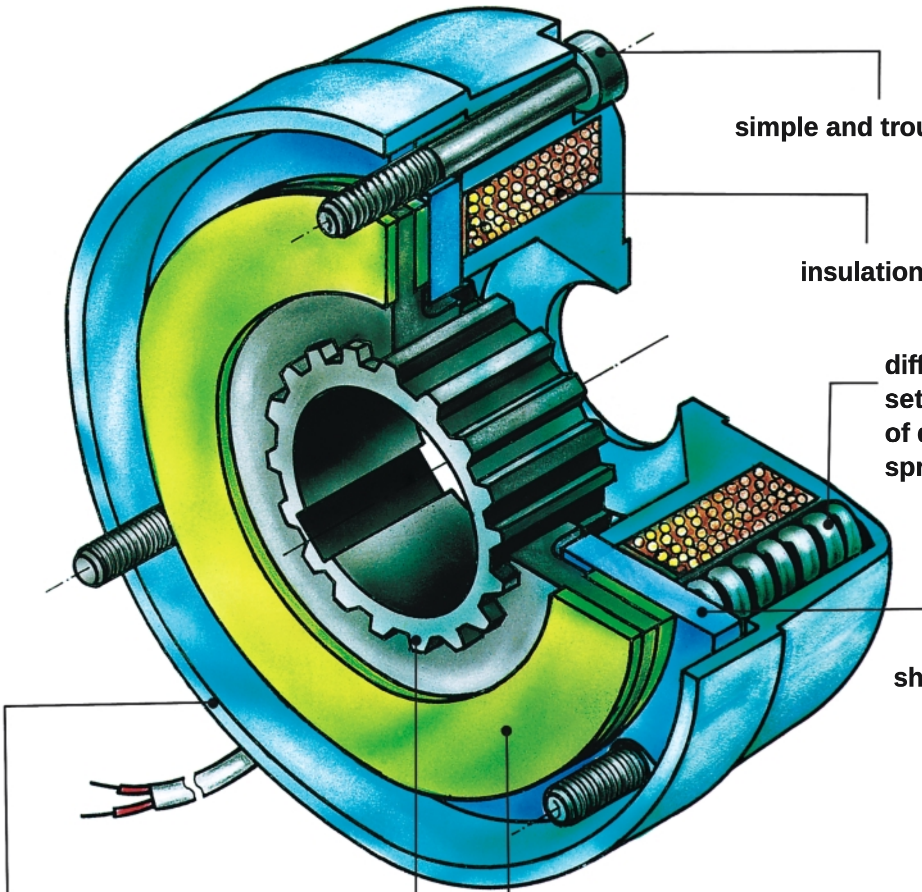
- ***fast and economic assembly***
- ***high protection IP54/IP65***
- ***maintenance-free for life of the rotor***

www.mayr.de

K.891.05.GB

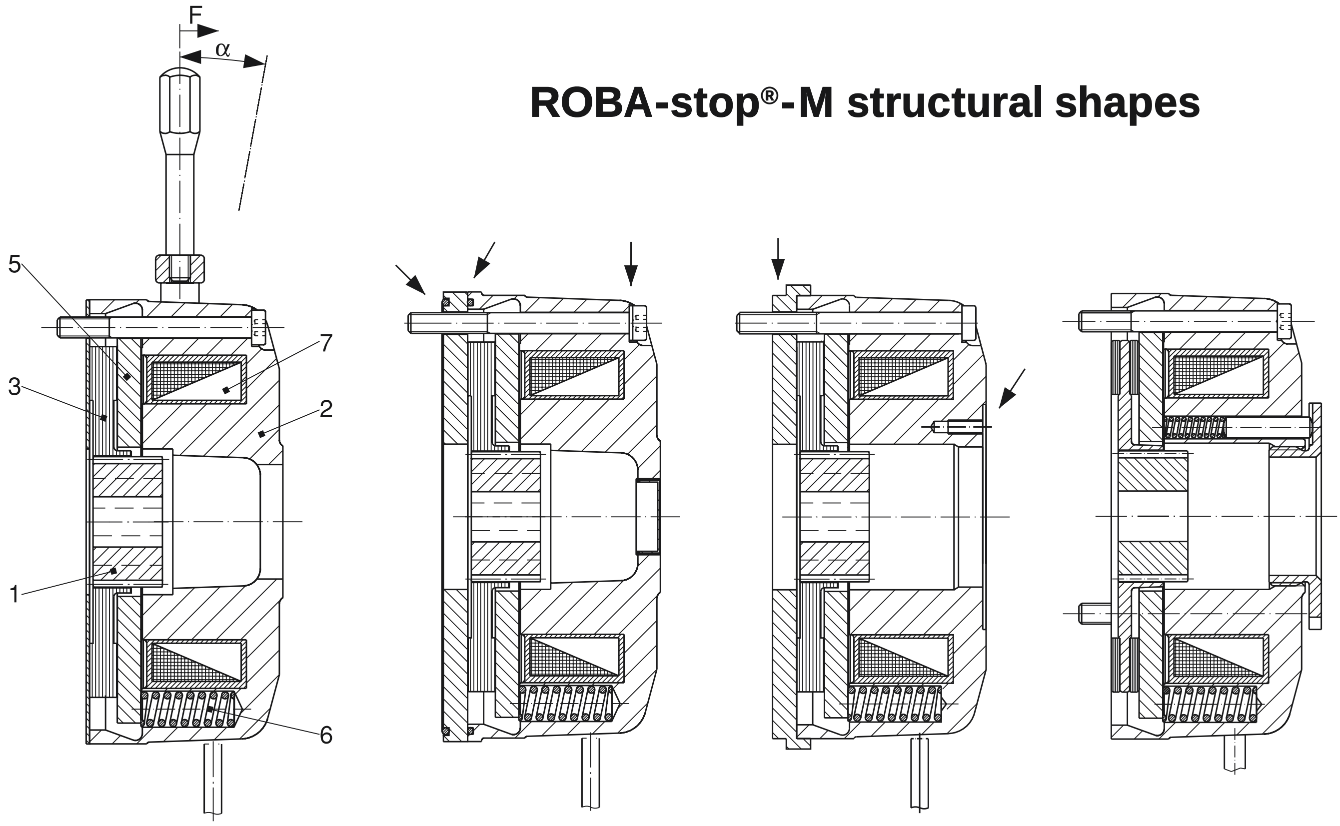
mayr®
power transmission

Your reliable brake



Contents

ROBA-stop®-M structural shapes



Type 891.213.0
Standard brake with friction disc (pages 4 – 5)

Type 891.214.1
Closed design (IP 65) with flange plate (page 5)

Type 891.214.2
Tacho attachment design with flange plate (page 5)

Type 891.260.3
Torque central adjustment (on request)

Function

ROBA-stop®-M are spring loaded electromagnetic safety brakes.

Spring loaded:

In a de-energised condition helical springs (6) press against the armature disc (5). The rotor (3) is held stationary between armature disc (5) and corresponding mounting surface of the machine. The shaft is braked via the gear hub (1).

Electromagnetic:

When power is switched on, a magnetic field is built up. The armature disc (5) is attracted to the coil carrier (2) against the spring pressure. The brake is released and the shaft is then able to rotate freely.

Safety brakes:

Safe and reliable braking action when the current has been switched off, in case of “emergency OFF“, or through power failure.

Characteristic features

- Easy assembly
- Brake completely enclosed at the outer diameter
- Protection IP54 and IP65 (other protections can be easily realised)
- Brake is designed up to 100 % ED and insulation class F
- The nominal air gap is constructively stated and inspected
- Short switching times
- Maintenance-free for the whole service life of the rotor.

Designs

Type 891._ _ _.0	standard brake
Type 891._ _ _.1	closed design IP65
Type 891._ _ _.2	design for tacho attachment
Type 891._ 6 _.3	design central adjustment (on request)

Modifications (see order example, page 9)

hand release – flange plate – sheet metal friction disc – metal rotor

Further ROBA-stop® brakes:

ROBA-stop®- Positioning Brake
exact positioning with high repetitive accuracy, sensitive torque setting.

ROBA-stop®- Holding Brake
for holding loads without (or minimum) friction work.

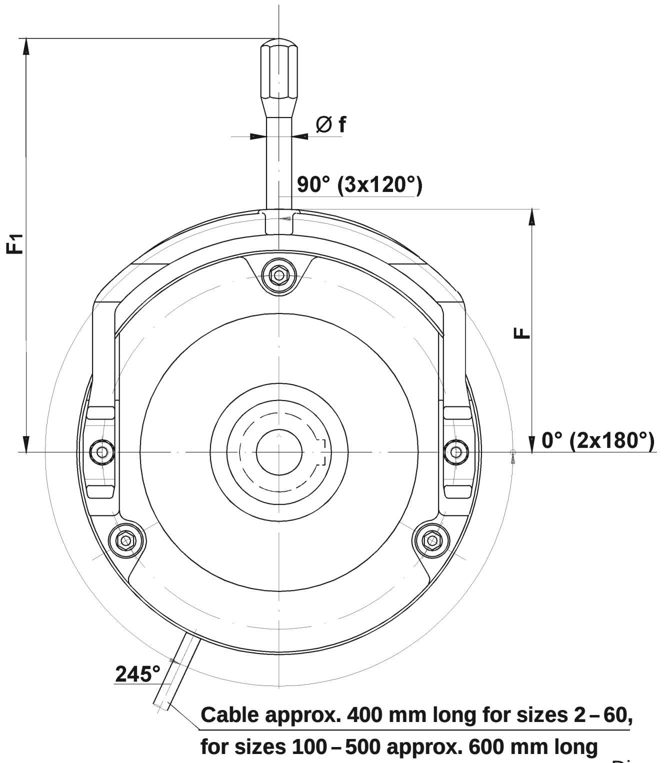
ROBA-stop®-Tacho Brake
for the attachment of a tacho generator.

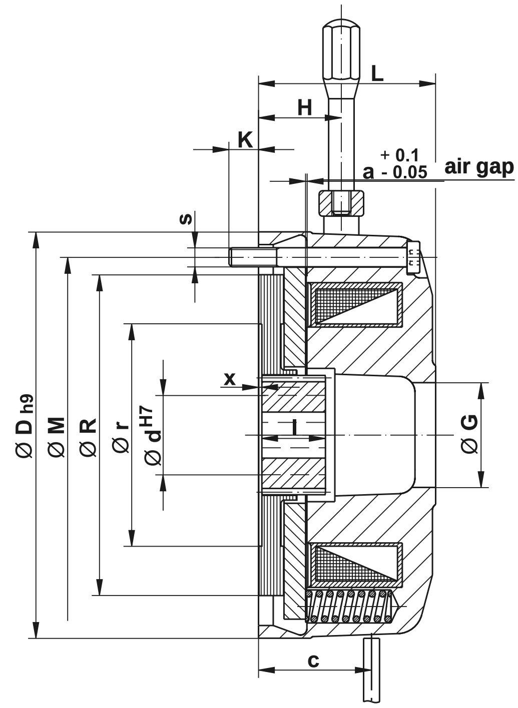
ROBA-stop®- Peak Load Brake
can absorb high friction work in case of peak loads.

ROBA-stop®- S
Peak Load Brake for the usage under extreme environmental conditions. Protection IP 67.

ROBA-stop®-Z
dual circuit brake for escalators

Please inquire for catalogues!





Dimensions Type 891._11.0

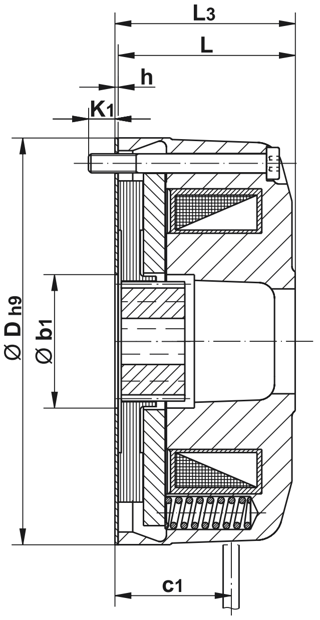
Technical data and dimensions

M-Brake Size	Brake torque Type 891.0/2_ _._ M_{nom} 1) [Nm]	Brake torque Type 891.1/3_ _._ M_{nom} 1.1) [Nm]	Max. speed n [rpm]	Input power P_{20} [W]	Type 891.0/2 d_{min}*	Type 891.0/2 d_{max}*	Type 891.1/3 d_{min}*	Type 891.1/3 d_{max}*	a	c	D_{h9}
2	2	4	6000	19	10	15 2)	10	15 2)	0,15	24	76
4	4	8	5000	25	10	15 2)	10	15 2)	0,15	26,5	87
8	8	16	4000	29	10	20 3)	11	20 3)	0,2	28,7	103
16	16	32	3500	38	15	25 4)	15	25 4)	0,2	35,5	128
32	32	64	3000	46	20	32 5)	20	32 5)	0,2	39,2	148
60	60	100	3000	69	22	35 6)	23	35 6)	0,25	50,5	168
100	100	180	3000	88	25	42	38	42	0,3	54	200
150	150	250	1500	98	30	50 7)	42	47 6)	0,3	59	221
250	250	450	1500	120	35	60 8)	52	57	0,35	69	258
500	500	800	1500	152	50	80 9)	60	76	0,4	70	310

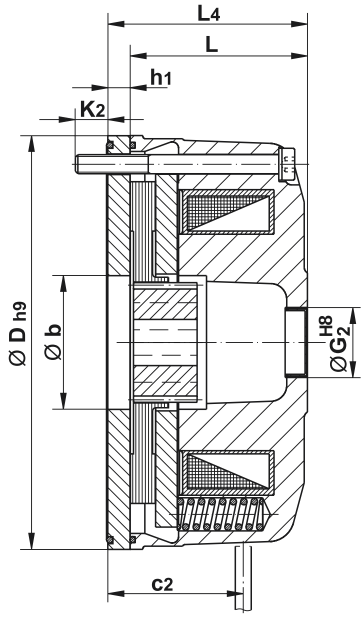
M-Brake Size	F	F_1	f	G	H	K	L	I	M	R	r	s	x
2	48,5	102,5	8	16,5	16	10	39	18	66	57	45	3 x M4	0 – 1
4	54	108	8	18	14,5	10,8	41,5	18	72	65	45	3 x M4	0 – 1,5
8	63,5	117,5	8	22	17,5	12,5	45,2	20	90	81	53	3 x M5	0 – 2,5
16	77	131	8	33	26	12,3	55,7	20	112	101	70	3 x M6	0 – 2,5
32	88	169	10	36	27	8,3	61,7	25	132	121	83	3 x M6	0 – 3
60	100,5	228,5	14	38	26	12	72,5	30	145	130,5	94	3 x M8	0 – 3
100	123	267	14	48	34	12	84	30	170	154	106	3 x M8	0 – 3
150	133	347	19	55	41	20	97	35	196	178	122	3 x M8	0 – 4,5
250	153	494	23	65	46	20	116	40	230	206	140	3 x M10	0 – 5
500	179	521	23	85	54,5	22	114	50	278	253	161	6 x M10	3 – 4

1) Brake torque tolerance = +30 %/-10 %, other settings as per table 2, page 7 and type chart page 9
1.1) Brake torque tolerance = +40 %/-20 % (slight grinding is necessary)
2) Above bore 13 keyway to DIN 6885/3
3) Above bore 18 keyway to DIN 6885/3
4) Above bore 23 keyway to DIN 6885/3
5) Above bore 30 keyway to DIN 6885/3
6) Above bore 32 keyway to DIN 6885/3
7) Above bore 47 keyway to DIN 6885/3
8) Above bore 57 keyway to DIN 6885/3
9) Above bore 76 keyway to DIN 6885/3
* **Observe load of shaft or keyway respectively!**

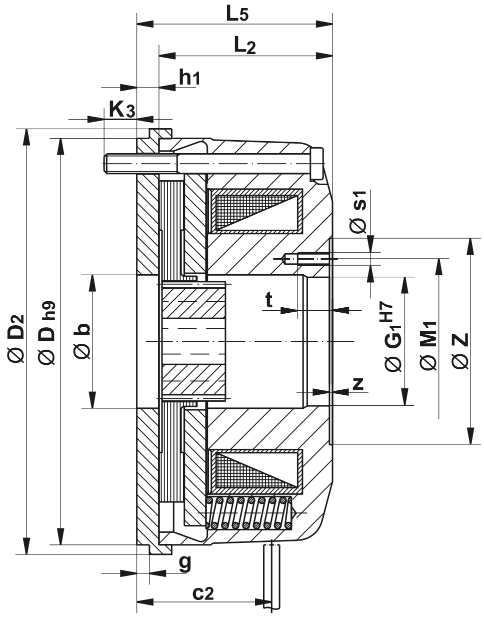
We reserve the right to make dimensional and design alterations.



Type 891._12.0



Type 891._14.1



Type 891._14.2

Technical data and dimensions

Missing dimensions are identical with Type 891.011.0 see page 4

M Brake Size	b	b_1	c_1	c_2	$D_{1\,h9}$	D_2	G_1	G_2^{H8}	g
2	30	30	25	29	81	81	23,5	–	4
4	30	30	27,5	32,5	92	92	28,5	–	4
8	36	36	29,7	34,7	108	108	32,5	22	4
16	42	42	36,8	42,5	130	134	40,5	22	4
32	52	52	40,5	47,2	148	154	52,5	28	4
60	60	62	51,8	58,5	168	174	60	32	4
100	78	–	–	64	200	206	75,5	42	5
150	84	–	–	71	221	227	82,5	48	6
250	96	–	–	83	258	266	92	52	7
500	130	–	–	89	310	318	131	62	7

M Brake Size	h	h_1	K_1	K_2	K_3	L_2	L_3	L_4	L_5	M_1	s_1	t	Z	z
2	1	5	9	10	10	38	40	44	43	29	3 x M3	6	36	1
4	1	6	9,8	9,8	9,8	40,5	42,5	47,5	46,5	35	3 x M4	10	45	1
8	1	6	11,5	11,5	11,5	44,2	46,2	51,2	50,2	41	3 x M4	10	55	1
16	1,25	7	11,1	10,3	10,3	54,7	57	62,7	61,7	52	3 x M4	10	65	1
32	1,25	8	7,1	10,3	10,3	60,7	63	69,7	68,7	61	3 x M5	10	75	1
60	1,25	8	10,8	14	14	71,5	73,8	80,5	79,5	75	3 x M5	10	90	1
100	–	10	–	12	12	83	–	94	93	88	3 x M5	10	100	1
150	–	12	–	18	18	96	–	109	108	100	3 x M6	10	115	1
250	–	14	–	25,5	26	115	–	130	129	112	3 x M6	10	130	1
500	–	19	–	21,5	23	113	–	133	132	145	6 x M8	13	175	1

Standard voltages 24; 104; 180; 207 V
Permissible voltage tolerance acc. to DIN; IEC 38 ± 10 %

We reserve the right to make dimensional and design alterations.

Assembly conditions

– The eccentricity of the shaft end relative to the fixing hole P.C.D. must not exceed 0,2 mm.
– The positioning tolerance of the thread for the fixing screws (8) must not exceed 0,2 mm.
– The deviation in the true running of the screw-on surface to the shaft must not exceed the permissible true running tolerance according to DIN 42955.

Fitting the brake

ROBA-stop®-M brakes are very easy to install:
– The hub (1) is mounted onto the shaft and is fixed axially (by means of a snap ring, for example).
– Recommended fit with shaft-hub connection = H7/k6.
– A connection of hub with shaft (especially with max. bore) being too tight must be avoided. It may cause a clamping of the rotor (3) on the hub (1) and hereby a troublefree function is not possible.
– The friction faces have to be free of oil and grease.
– Push rotor (3) onto the hub (1).
– Secure brake at the B-bearing flange of the motor or on the machine housing by mounting bolts (8) (observe tightening torques according to table 1).

*** Attention! Use only *mayr*®- original screws (Table 1).**

If there are no suitable mating-friction surfaces made of grey cast iron or steel available, the brake types 891.__2/3._ (with friction disc (9)) or 891.__4/5._ (with flange plate) are to be used.

<u>When using a brake with friction disc (Type 891.__2/3._) the stamping on the friciton disc „friction side“ must be observed.</u>

Attention! Observe supporting length for the keyway according to dimension list, page 4.

Adjusting the brake torque

Because of various spring configurations (6) in the coil carrier (2) different torque settings can be achieved (see table 2). Design with continuous setting on request.

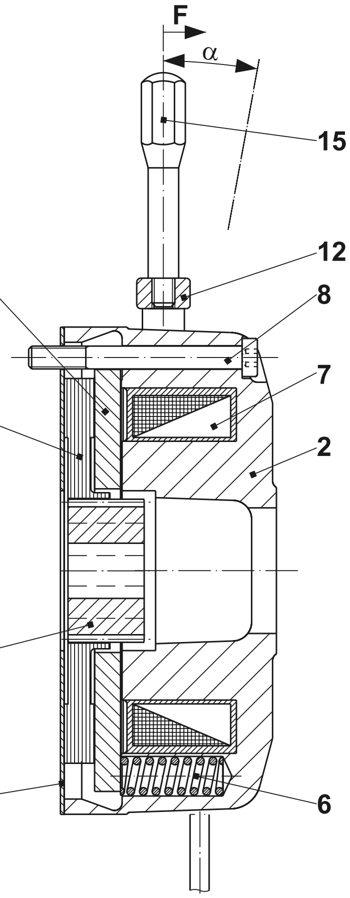


Fig. 1

Fitting the hand release (see Figs. 1 and 2)

The hand release can only be fitted in a dismantled condition of the brake.

Procedure:
– Unscrew brake from B-bearing flange or machine wall.
– Remove plugs out of hand release bores in the coil carrier (2).
– Put pressure springs (10) onto the hand release bolts (11).
– Push hand release bolts (11) with pressure springs (10) from the inside (direction of view to magnetic coil) into the hand release bores in the coil carrier.
– Attach hand release bracket (12), put disc (13) on it and screw slightly self-locking nuts (14).
– Tighten both locking nuts (14) until the armature disc (5) contacts **<u>uniformly</u>** the coil carrier (2).
– Unscrew both locking nuts (14) by “y“ rotations (table 1) and re-establish herewith the air gap between armature disc (5) and coil carrier (2) or the inspection dimension “x“.
– After the fan cover has been assembled, screw in the hand release bracket (15) and tighten it.

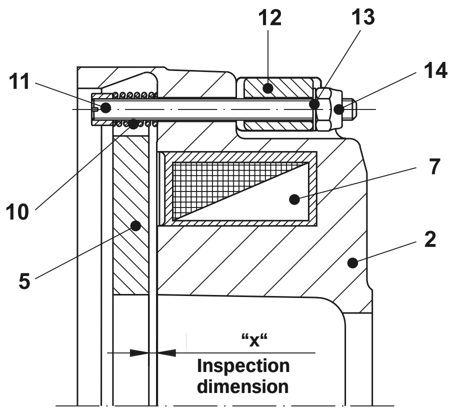


Fig. 2

M-Brake Size	Inspection dimension “x“ [mm]	Number of rotations “y“	Release force F Type 891.01_._ [N]	Release force F Type 891.11_._ [N]	Release angle α [°]	* Fixing screw (8) Type 891.__0._	DIN	Type 891.__4._	DIN	Tightening torque for fixing screw (8) [Nm]
2	0,9 $^{+0,1}$	1,7	20	26	6	3 x M4 x 45	6912	3 x M4 x 50	912	2,5
4	0,9 $^{+0,1}$	1,7	35	45	7	3 x M4 x 45	6912	3 x M4 x 50	912	2,5
8	1,1 $^{+0,1}$	1,5	70	90	7	3 x M5 x 50	6912	3 x M5 x 55	6912	5,0
16	1,6 $^{+0,1}$	2,0	100	125	7	3 x M6 x 60	6912	3 x M6 x 65	6912	9,0
32	1,8 $^{+0,1}$	2,0	130	170	8	3 x M6 x 60	6912	3 x M6 x 70	912	9,0
60	2,2 $^{+0,1}$	2,0	220	300	10	3 x M8 x 75	6912	3 x M8 x 85	912	22
100	2,2 $^{+0,1}$	1,6	260	340	12	3 x M8 x 80	912	3 x M8 x 90	912	22
150	2,2 $^{+0,1}$	1,6	290	350	13	3 x M8 x 100	912	3 x M8 x 110	912	22
250	2,4 $^{+0,1}$	1,5	350	430	10	3 x M10 x 110	912	3 x M10 x 130	912	45
500	2,4 $^{+0,1}$	1,5	230	380	8	6 x M10 x 110	912	6 x M10 x 130	912	45

Table 1

Table braking torque adjustments

M - Brake - Size				2	4	8	16	32	60	100	150	250	500
Braking torque settings [Nm]	Holding brake			4	8	16	32	64	100	180	250	450	800
	Standard brake	Braking torque in %	125%	2,5	5	10	20	40	75	125	185	312	700
			112%	2,2	4,5	9	18	36	68	110	165	280	600
			100%	2	4	8	16	32	60	100	150	250	500
			84%	1,7	3,4	6,8	13,5	27	51	85	125	215	400
			68%	1,4	2,8	5,5	11	22	42	70	100	180	350
			50%	1	2	4	8	16	30	50	75	125	250
			34%	0,7	1,4	2,8	5,5	11	21	35	50	90	200
Rotor thickness “new“				6,05	6,05	6,9	8	10,4	11,15	14	15,5	17	18,5

Table 2

Maintenance

ROBA-stop®-M brakes are virtually maintenance-free.
The friction lining is robust and wear resistant and the brake achieves a very long service life.
However, if the rotor has obtained the max. permissible degree of wear due to a high total friction work, the brake can be brought to its initial condition by changing the rotor. The brake must be cleaned thoroughly.

Attention!
For brakes with reduced braking torque and/or operation with fast acting rectifier the brake function is not guaranteed any more after the friction linings are worn.

Electrical connection

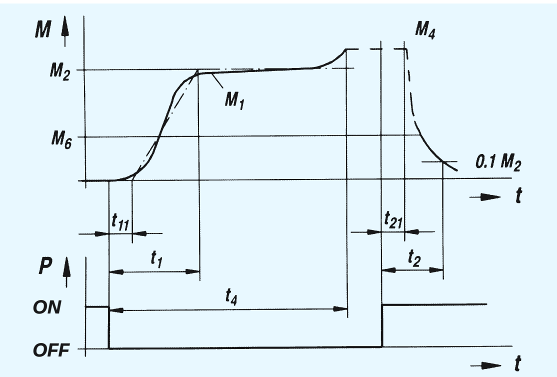
The brakes are designed to Euro-voltage DIN IEC 38.
A D.C. current is necessary for the operation. The same can be generated via a transformer rectifier or half-wave rectifier or bridge rectifier respectively.

D.C. current or A.C. current switchings are possible.

D.C. current switching, however, gains a faster engaging time (t_1) (engagement of the brake).

In case a faster disconnection time is desired (t_2), a special fast acting rectifier is necessary. In this case please contact our company.

Switching times



Torque - Time - Diagram

It means:

M_1 = Switching torque
M_2 = Nominal torque (characteristic torque)
M_4 = Transmittable torque
M_6 = Load torque
t_1 = Engaging time
t_{11} = Delay in re-action during engagement
t_2 = Disconnection time
t_{21} = Delay in re-action during disconnection

The values indicated in table 3 are mean values which refer to the nominal air gap with warm brake.

– = switching on the D.C. side
~ = switching on the A.C. side

M-Brake Size	M_2 [Nm]	t_1 – [ms]	t_1 ~ [ms]	t_2 [ms]	t_{11} – [ms]	t_{21} [ms]
2	2	10	100	28	6	4
4	4	18	160	30	12	5
8	8	20	220	45	16	6
16	16	30	320	70	25	12
32	32	50	400	100	35	20
60	60	55	500	150	35	23
100	100	68	640	180	38	25
150	150	80	730	220	40	30
250	250	120	1100	290	50	35
500	500	100	1100	400	30	50

Table 3

Design

Brake selection:

$$M_{req.} = \frac{9550 \times P}{n} \times K \leq M_2 \ [Nm]$$

$$t_v = \frac{J \times n}{9{,}55 \times M_v} = [sec]$$

$$t_4 = t_v + t_1 \ [sec]$$

$$M_v = M_2 + (-)^* M_L \ [Nm]$$

$$J_1 = J_2 \times \left(\frac{n_2}{n_1}\right)^2 \ [kgm^2]$$

Examination of the thermal load:

$$Q_r = \frac{J \times n^2}{182{,}4} \times \frac{M_2}{M_v} \ [J/braking\ action]$$

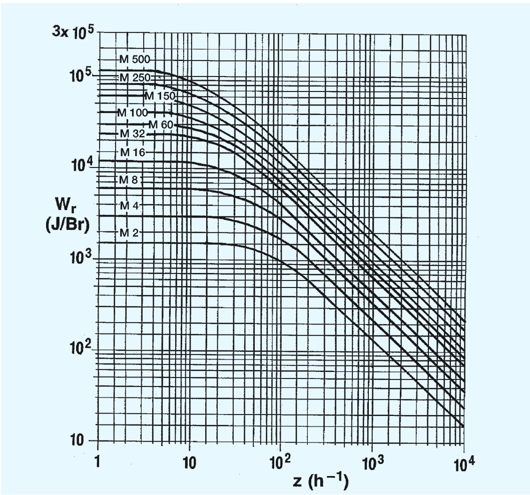
The permissible friction work per braking action with given switching frequency can be taken from the opposite friction work-diagram.

With known friction power per braking action the max. switching frequency can be taken from the opposite friction work-diagram.

Attention!
When using a brake with friction plate (Type 891._ _$^2_3$._) the max. friction work and friction power is to be reduced.
The wear values $Q_{r\,0,1}$ and $Q_{r\,tot.}$ are not valid for this.

Designation:

$M_{req.}$	[Nm]	=	required braking torque
M_v	[Nm]	=	deceleration torque
M_L	[Nm]	=	load moment * omen in parentheses (–) is valid with load braked descending
M_2	[Nm]	=	nominal torque
P	[kw]	=	power
n	[rpm]	=	speed
K	[–]	=	safety factor (depending on conditions 1 – 3 times)
t_v	[sec]	=	deceleration time in case of braking
t_4	[sec]	=	switch-on time
t_1	[sec]	=	engaging time
J	[kgm^2]	=	mass moment of inertia
J_1	[kgm^2]	=	reduced mass moment of inertia
Q_r	[J/braking]	=	existing friction work per braking action
$Q_{r\,0,1}$		=	friction work per 0,1 mm wear
$Q_{r\,tot.}$		=	friction work until change of rotor



Friction power diagram

M - Brake - Size / Type	M_2 [Nm]	$Q_{r\,0,1}$ [J/0,1]	$Q_{r\,tot.}$ [J]	J Rotor + Hub with d_{max} [kgm^2] 891.$^0_1$_ _._	891.$^2_3$_ _._	m [kg]
2 / Type 891.$^0_2$_ _._	2	35 x 10^6	95 x 10^6	0,12 x 10^{-4}	0,1 x 10^{-4}	0,76
2 / Type 891.$^1_3$_ _._	4	7 x 10^6	7 x 10^6			
4 / Type 891.$^0_2$_ _._	4	40 x 10^6	100 x 10^6	0,21 x 10^{-4}	0,17 x 10^{-4}	1,1
4 / Type 891.$^1_3$_ _._	8	8 x 10^6	8 x 10^6			
8 / Type 891.$^0_2$_ _._	8	65 x 10^6	162 x 10^6	0,67 x 10^{-4}	0,58 x 10^{-4}	1,8
8 / Type 891.$^1_3$_ _._	16	13 x 10^6	13 x 10^6			
16 / Type 891.$^0_2$_ _._	16	100 x 10^6	500 x 10^6	1,74 x 10^{-4}	1,53 x 10^{-4}	3,4
16 / Type 891.$^1_3$_ _._	32	20 x 10^6	20 x 10^6			
32 / Type 891.$^0_2$_ _._	32	130 x 10^6	600 x 10^6	4,48 x 10^{-4}	4,1 x 10^{-4}	4,5
32 / Type 891.$^1_3$_ _._	64	30 x 10^6	45 x 10^6			
60 / Type 891.$^0_2$_ _._	60	130 x 10^6	700 x 10^6	6,74 x 10^{-4}	–	7,4
60 / Type 891.$^1_3$_ _._	100	65 x 10^6	130 x 10^6			
100 / Type 891.$^0_2$_ _._	100	140 x 10^6	840 x 10^6	16,54 x 10^{-4}	–	13,6
100 / Type 891.$^1_3$_ _._	180	70 x 10^6	170 x 10^6			
150 / Type 891.$^0_2$_ _._	150	150 x 10^6	950 x 10^6	31,68 x 10^{-4}	–	19,2
150 / Type 891.$^1_3$_ _._	250	75 x 10^6	300 x 10^6			
250 / Type 891.$^0_2$_ _._	250	160 x 10^6	1000 x 10^6	61,82 x 10^{-4}	–	33,3
250 / Type 891.$^1_3$_ _._	450	80 x 10^6	350 x 10^6			
500 / Type 891.$^0_2$_ _._	500	200 x 10^6	2000 x 10^6	222,6 x 10^{-4}	–	38
500 / Type 891.$^1_3$_ _._	800	100 x 10^6	500 x 10^6			

Table 4

Type chart – Order example:

To be included when ordering, please state:	Size	Type	Voltage [VDC]	Bore Ø d	Keyway to DIN
Order number:		8 9 1 . _ _ _ . _			

M2 ÷ M500 (Size)

Standard brake metal rotor . . . . 0[3)]
Holding brake metal rotor **** 1
Standard brake friction lining rotor . . . . 2[4)]
Holding brake friction lining rotor . . . . 3[2)]

Nominal torque holding brake 0
Nominal torque standard 1
84% of nominal torque ** 2
68% of nominal torque ** 3
50% of nominal torque ** 4
34% of nominal torque ** 5
Nominal torque adjustable . . . . 6[2)]
112% of nominal torque ***** 7
125% of nominal torque ***** 8

0 Without supplementary parts
1 Hand release [1)]
2 Friction disc
3 Hand release/friction disc [1)]
4 Flange plate
5 Hand release/flange plate [1)]

0 Standard
1 Closed design IP 65 *
2 Tacho design ***
3[2)] Torque central adjustment

Voltage: 24; 104; 180; 207 V-coil

Bore: According to size

Keyway: 6885/1 or 6885/3

* not in connection with hand release or friction disc
** see technical explanations page 7
*** not in connection with friction disc
**** only in connection with nominal torque - holding brake Type 891.10_._

[1)] Hand release not assembled
[2)] On request
[3)] From size 60 on
[4)] For use of the brakes in hoisting drives, please contact the factory.

Example: Order number M16/891.211.0/24/16/6885-1

Manufacturer's declaration

ROBA-stop®-M brakes work according to the principle of the spring applied brakes and are as rectifiers, phase demodulators, ROBA®-switch, spark quenching units and power supply units not machines within the scope of the Machinery directive 98/37/EG, but components for installation into machines. An initial start up is prohibited until it has been noticed that the machinery or the equipment into which this product has been incorporated correspond to the EG-guide lines.

ROBA-stop®-M brakes are developed and manufactured in conformance with the national standard DIN VDE 0580 according to the low-voltage directives 73/23/EWG.

The observance of the relevant EMV-guide line 89/336/EWG is to be guaranteed.

Safety regulations

Attention!

Hazardous conditions when contacting hot connections and components

Danger!

- if the spring applied brake is used in an improper way,
- if the spring applied brake has been modified or reconverted,
- if the relevant standards of the safety or installation conditions are not observed.

Only qualified and well-trained specialists should work on the units to avoid any personnel injury or damage to machinery.

Attention!

The installation and operating instructions must be read carefully and all safety regulations observed before installation and initial operation as danger to personnel and damage to machinery may be caused.

Spring applied brakes are developed and manufactured in conformance with the temporally known rules of the technology and they are basically considered as fail-safe at the time of the delivery.

Spring applied brakes are not suitable for the application in potentially explosive or aggressive atmospheres.

Observe!

- Only qualified and well-trained specialists who are familiar with the transport, installation, initial start-up, maintenance and operation of the units as well as with the relevant standards may carry out the corresponding works.
- Technical data and indications (Type tag and documentation) are to be kept absolutely.
- Correct supply connection according to Type tag.
- Supply connections must not be released and assembly , maintenance or repair must not be made when the unit is energised.
- Electrical leads must not be under tension when connected.
- Check current carrying components regarding damage before installation. Current carrying components must not be in contact with water.
- **The braking torque does not exist any more,** if the friction lining and friction surface come into contact with oil or grease.

With these safety notes no claim on completeness is raised!

Necessary protective measures to be undertaken by the user:

- Cover all moving parts to prevent personnel injury as squeezing and seizing.
- Cover dangerously hot magnetic parts to prevent contact.
- Attach a conductive connection between magnetic part and electrical conductor (PE) of the fixed installation (protection class I) to prevent electrical shock.
- Install spark quenching units to prevent high inductive cut-off peaks.

Note to electromagnetic compatability (EMV)

There are no emissions from the listed single components within the meaning of EMV guide line 89/336/EWG. However, increased interference levels can occur when working components are operated outside their specification limits as for example, energising the brake with rectifiers, phase demodulators or ROBA®-switch in the line side.

Therefore, the installation and operating instructions must be read carefully and the EMV guide lines are to be observed.

Standards and Instructions

ROBA-stop®-M-brakes are developed and manufactured in conformance with the national standard DIN VDE 0580 according to the low-voltage directive 73/23/EWG.

Following directives have been used:

98/37/EG	Machinery directive
73/23/EWG	Low-voltage directive
89/336/EWG	EMV-guide line

Protection class I

The protection is not only based on the basis isolation, but that all conductive components must be connected with the protective conductor of the fixed installation. In case the basis isolation fails, no contact voltage can remain existing.
(EN 50144-1, 11.99, classification VDE 0740-1)

Protection IP 54

Dustproof and protection against contact and splash water from all directions. (DIN EN 60529)

Ambient temperature: -20 °C up to +40 °C

Attention!

The torque could be severely reduced in case of temperatures over or under the freezing point due to thawing. The user must provide corresponding counter measures.

Conditions of the unit

The catalogue values are for reference only, and may vary in certain cases. When selecting the brake, site of installation, braking torque fluctuations, permissible friction work, behaviour during run-in, wear and ambient conditions are to be carefully checked and agreed with the unit manufacturer.

Observe!

- The mounting and connecting dimensions at the site of installation must match to the size of the brake.
- ROBA-stop® brakes are designed for a relative continuous operation.
- ROBA-stop® brakes are designed for a dry running ***only.***

Attention!

Should oil, grease, water or similar materials come in contact with the friction surfaces **the braking torque could be reduced**.

- The braking torque depends on the corresponding running-in condition of the brake.
- **Protective system** for damping of overvoltages, as high inductive voltage peaks occur when the brake is switched off on the DC side which can result in damage to the coil isolation as well in the burning away of the switching contact in extreme cases.
- Provide additional necessary safety measures against corrosions of the brake if they are used in extreme ambient conditions or in the open with direct atmospheric influences. The metallic surface of the brake is protected against corrosion arranged by the factory.

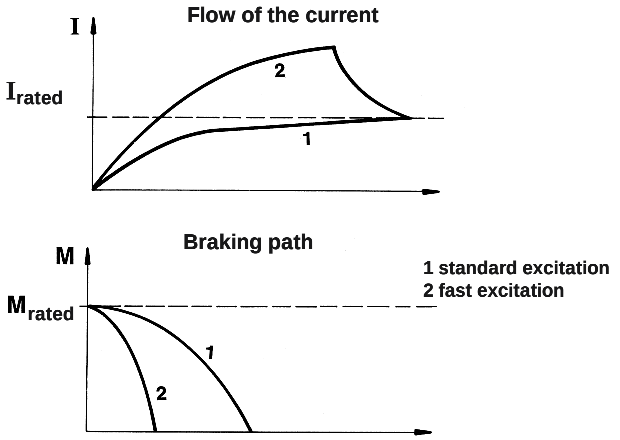
Switching behaviour

Build-up of the magnetic field:

When switching on the voltage a magnetic field in the brake coil is built-up and the armature disc is attracted to the coil carrier by the same; the brake releases.

Field build-up with standard excitation:

When rated voltage is applied to a brake field coil, the coil current does not achieve its nominal value immediately. The inductivity of the coil effects that the current slowly rises in the form of an exponential curve. The build-up of the magnetic field and, therefore, the torque rise also ensures delay accordingly (Fig. 1, curve 1).



Field build-up with overexcitation:

A fast drop fo the brake torque can be achieved, if a higher voltage than the rated voltage is applied to the coil for a short time. Herewith the current rises faster. When the brake has released you can switch over to the rated voltage (Fig. 1, curve 2). The interrelationship between overexcitation and switching time is approximately proportional up to 4 times the rated voltage, i.e. doubling the rated voltage, halves the switching time for releasing the brake.
The ROBA®-switch fast acting rectifier uses this behaviour for 104 V-coils (see page 16) as well as the phase demodulator (see page 15).

Reducing the magnetic field

AC voltage switching:

The circuit of the magnetic coil is interrupted in front of the rectifier (Fig. 2), i.e. in the mains side.
When switching off the coil voltage, the magnetic field effects that the coil current conducts further via the rectifier diodes and only drops very slowly. The magnetic field reduces itself slowly and effects that the brake torque slowly rises (Fig. 4; curve 1).
An AC voltage switching should be carried out, if switch-off times are insignificant. An AC voltage switching does not require any protective arrangements for coil or switching contacts as the rectifier diodes act as recovery diodes when switching off.

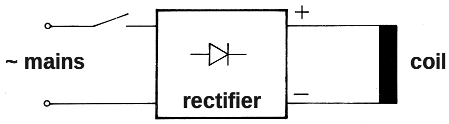


Fig. 2

DC voltage switching:

The coil current is interrupted between rectifier and coil (Fig. 3).
The magnetic field reduces itself quickly — fast rise of the brake torque. In case of DC voltage spikes are generated in the coil, which lead to a very quick wear of the switching semiconductors.
The switching contact has to be protected against consumption.

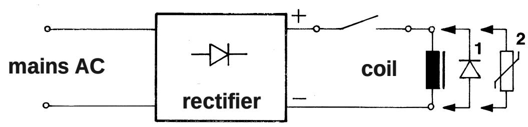


Fig. 3

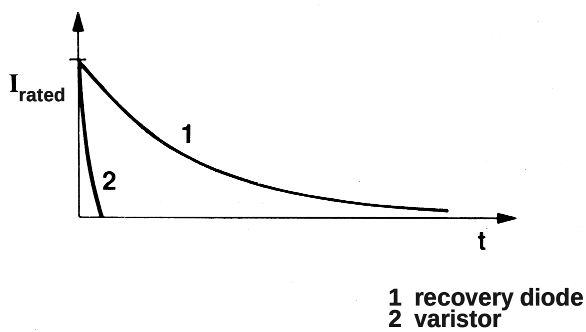
Protective wiring

Protective arrangements are necessary to protect the coil against high spikes and to protect the switching.

Protective wiring:
1. Recovery diode parallel to the coil — yields the same switching times as the AC voltage switching (Fig. 4, curve 1).
2. Adapted varistor parallel to the coil — simple adaption, good protection, fast reducing of the magnetic field with defined switching-off voltage (Fig. 4, curve 2).

To achieve both items it is the best to use Mayr Power Transmission spark quenching units (see page 17).

Flow of the current



Brake torque path

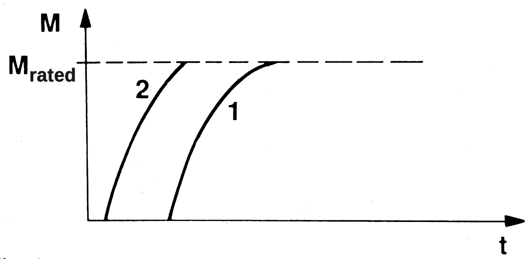
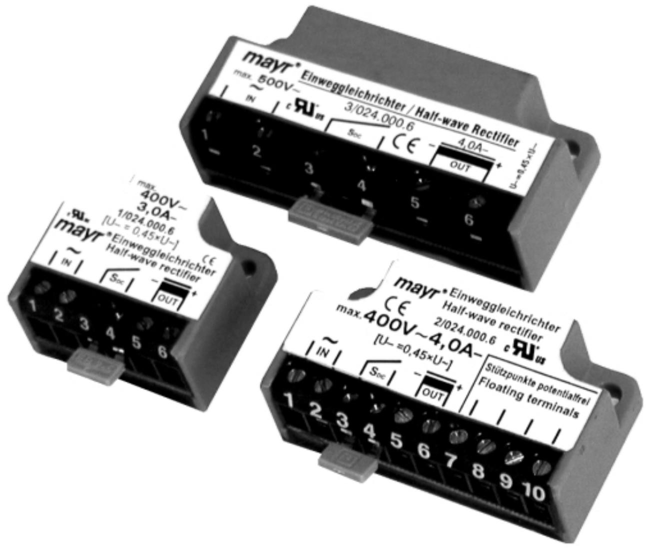


Fig. 4

Manufacturing declaration

Rectifiers are components in compliance with the machine guide line 98/37/EG which are determined for installation into a machine.
An operation is prohibited until the machine guide line for the final product in which this unit is fitted if fullfilled.
The rectifier corresponds to the low-voltage recommendation 73/23/EG.
Note for malfunction signal:
The rectifier does not generate any malfunction signals, however, malfunction signals above the permissible limit values might be possible in connection with other components.
The EMV-corresponding installation is to be observed.

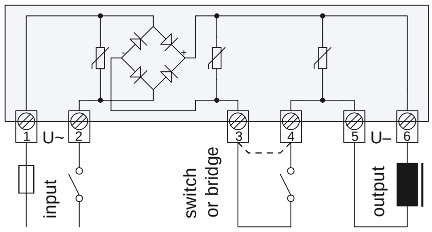


Application

Rectifiers are used to connect DC coils to AC voltage supply. For example: Electromagnetic brakes and clutches (ROBA-stop®, ROBA-quick®, ROBATIC®), also electromagnets, electrovalves, contactors, inrush current proof DC motors, etc...

Bridge rectifier

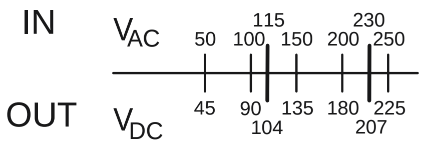
Wiring diagram



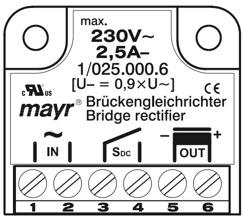
Formula

for calculation of the bridge-output voltage

$$V_{DC} = V_{AC} \times 0,9$$



Type 1/025.000.6



Characteristic:
6-pole terminal block

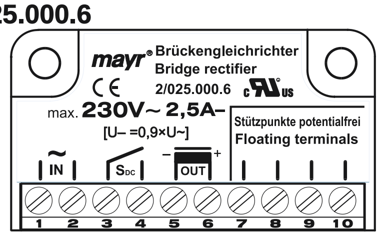
Technical data:

AC voltage (IN)	max. 230 VAC
output voltage (OUT)	Max. 207 VDC
max. current load	2,5 Amp. with ≤ 50 °C ambient temp. 1,7 Amp. with ≤ 85 °C ambient temp.
peak reverse voltage	1600 V

Permissible max. coil power:

IN (VAC)	OUT (VDC)	Watt with ambient temperature
115	104	up to 177 Watt with ≤ 85 °C ambient temp. up to 260 Watt with ≤ 50 °C ambient temp.
230	207	up to 352 Watt with ≤ 85 °C ambient temp. up to 517 Watt with ≤ 50 °C ambient temp.

Type 2/025.000.6



Characteristic:
10-pole terminal block (7-10 disposable)

Technical data:

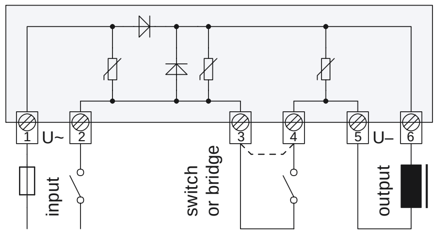
AC voltage (IN)	max. 230 VAC
output voltage (OUT)	max. 207 VDC
max. current load	2,5 Amp. with ≤ 50 °C ambient temp. 1,7 Amp. with ≤ 85 °C ambient temp.
peak reverse voltage	1600 V

Permissible max. coil power:

IN (VAC)	OUT (VDC)	Watt with ambient temperature
115	104	up to 177 Watt with ≤ 85 °C ambient temp. up to 260 Watt with ≤ 50 °C ambient temp.
230	207	up to 352 Watt with ≤ 85 °C ambient temp. up to 517 Watt with ≤ 50 °C ambient temp.

Half-wave rectifier

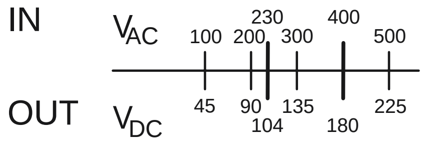
Wiring diagram



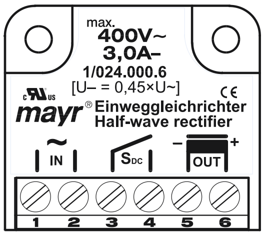
Formula

for calculation of the half-wave-output voltage

$$V_{DC} = V_{AC} \times 0,45$$



Type 1/024.000.6



Characteristic:
6-pole terminal block

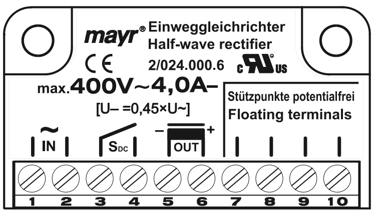
Technical data:

AC voltage (IN)	max. 400 VAC
output voltage (OUT)	max. 180 VDC
max. current load	3 Amp. with ≤ 50 °C ambient temp. 1,8 Amp. with ≤ 85 °C ambient temp.
peak reverse voltage	2000 V

Permissible max. coil power:

IN (VAC)	OUT (VDC)	Watt with ambient temperature
230	104	up to 187 Watt with ≤ 85 °C ambient temp. up to 312 Watt with ≤ 50 °C ambient temp.
400	180	up to 324 Watt with ≤ 85 °C ambient temp. up to 540 Watt with ≤ 50 °C ambient temp.

Type 2/024.000.6



Characteristic:
10-pole terminal block (7-10 disposable)

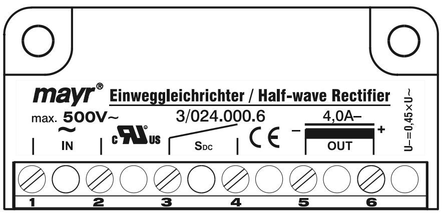
Technical data:

AC voltage (IN)	max. 400 VAC
output voltage (OUT)	max. 180 VDC
max. current load	4 Amp. with ≤ 50 °C ambient temp. 2,4 Amp. with ≤ 85 °C ambient temp.
peak reverse voltage	1600 V

Permissible max. coil power:

IN (VAC)	OUT (VDC)	Watt with ambient temperature
230	104	up to 250 Watt with ≤ 85 °C ambient temp. up to 416 Watt with ≤ 50 °C ambient temp.
400	180	up to 432 Watt with ≤ 85 °C ambient temp. up to 720 Watt with ≤ 50 °C ambient temp.

Type 3/024.000.6



Characteristic:
6-pole terminal block

Technical data:

AC voltage (IN)	max. 500 VAC
output voltage (OUT)	max. 225 VDC
max. current load	4 Amp. with ≤ 50 °C ambient temp. 2,4 Amp. with ≤ 85 °C ambient temp.
peak reverse voltage	2000 V

Permissible max. coil power:

IN (VAC)	OUT (VDC)	Watt with ambient temperature
230	104	up to 250 Watt with ≤ 85 °C ambient temp. up to 416 Watt with ≤ 50 °C ambient temp.
400	180	up to 432 Watt with ≤ 85 °C ambient temp. up to 720 Watt with ≤ 50 °C ambient temp.
500	225	up to 540 Watt with ≤ 85 °C ambient temp. up to 900 Watt with ≤ 50 °C ambient temp

Type 4/024.000.6

(without illustration)

Characteristic:
6-pole terminal block

IN (VAC)	OUT (VDC)	
600	270	max. current load 4 Amp.

Switching example - switching in the line side -

Features
- Interruption in the line side.
- Free-wheel current of the coil reduces slowly across the rectifier diode.
- Switching-off voltage approx 1 V.
- Armature disc engages smoothly.
- Long switching time t_{21}.

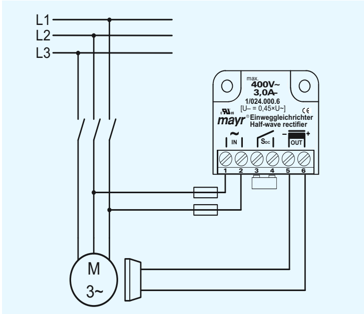


Fig. 1

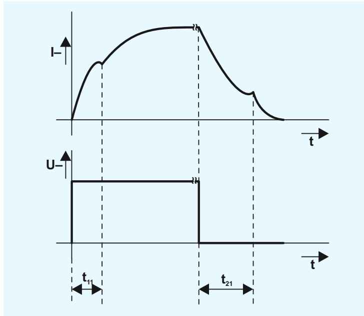


Fig. 2

Switching example - switching in the line and coil sides.

Features
- Interruption in the line and coil sides.
- Free-wheel current of the coil reduces fast across varistor and switching contact.
- Switching-off voltage approx. 500 ... 1200 V.
- Armature disc engages roughly.
- Short switching time t_{21}.

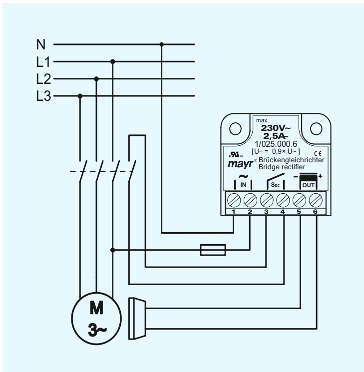


Fig. 3

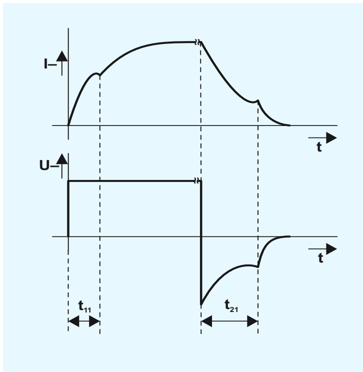


Fig. 4

Technical data

AC-supply voltage	(see table of sizes)
Current load	(see table of sizes)
Protection	IP 65 components, compound potted IP 20 terminal
Ambient temperature	-25 °C up to +85 °C
Storage temperature	-25 °C up to +125 °C
Terminal cross section	max. 1,5 mm^2
Weight	size 1 28g size 2 47g size 3 52g

Standards

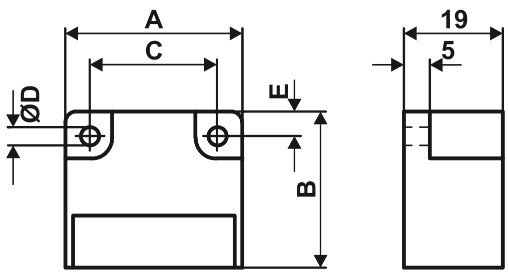
Checked EMC Electromagnetic compatibility
EN 61000-4-4 (Burst) 2 kV
EN 61000-4-5 (Surge) 2 kV (between the wires)

Insulation coordination according to DIN VDE 0110-1 (modif. IEC 60664-1)
Overvoltage category III
Pollution degree 3
Rated voltage 500 V_{eff}

Observe important standards for the installation:

EN 60204	security of machines
EN 292	security of machines, basic terms
EN 55014	interference suppression of electrical equipment
VDE 0100	assembly of power plants with nominal voltage up to 1000 V
Approvals:	UL Standard UL 508 CSA Standard C22.2 No. 14-M91

Dimensions



size	A	B	C	ØD	E
1	34	30	25	3,5	4,5
2	54	30	44	4,5	5
3	64	30	54	4,5	5

Accessory:
Mounting set for 35mm mounting rail acc. to EN 50022.
PN. 1802911

Order example:

To be included when ordering, please state:	size	type
Order number:	0 2 _	. 0 0 0 . 6

sizes 1 ÷ 3
4 Half wave rectifier
5 Bridge rectifier

Example: Order number 2 / 025.000.6
(for bridge rectifier: size 2)

Manufacturing declaration

The phase rectifier corresponds to the regulation of low voltage directives 73/23/EWG. The safety regulations are to be observed.

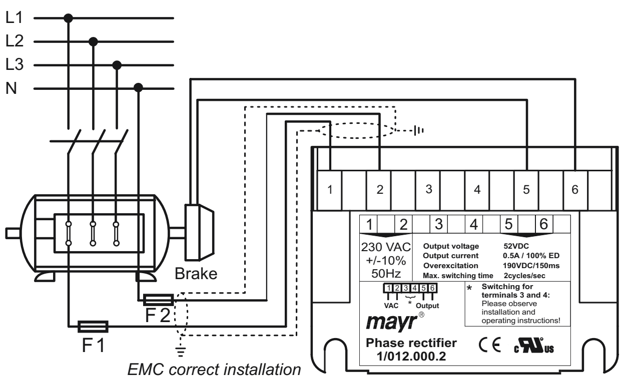
Application

- Fast switching of 104 VDC-coils, reducing to 52 VDC-coils-holding voltage.
  Advantage: reducing of the coil temperature
- AC voltage ON and OFF switchings of the coil with shortest attraction and releasing times.
- Built-in spark quenching for the switch contact.

Function

The phase rectifier is provided for an operation at 230 VAC or 400 VAC supply voltages. During "ON-switching" of the supply voltage the coil is energised with overexcitation voltages of 190 VDC or 330 VDC.
When the overexcitation time has passed the unit switches the coil to a holding voltage of 52 VDC or 104 VDC. During "OFF-switching" the coil is de-energised.
The ON and OFF switching is always alternating.
Shortest switch-OFF times are achieved using an integrated electronic voltage relay.

Switching example



- switching in the DC and AC sides

Fuse protection

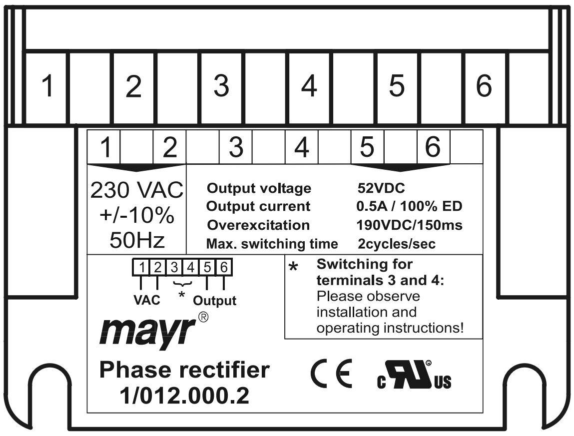
The customer must provide external fuse protections (F1 and F2) for protection against short circuits or earth fault in the supply lines.

Supply voltage	Current (Amp)	Dimension (mm)	Breaking capacity
230 VAC	FF 5 A	5 x 20	H
400 VAC	FF 4 A	6,3 x 32	H

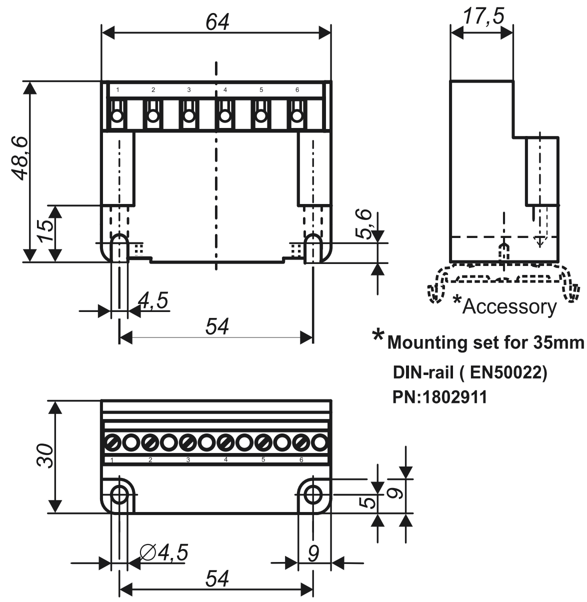
Order example:

To be included when ordering, please state:	size	type
Order number:		0 1 2 . 0 0 0 . 2

Device view



Dimensions



*Mounting set for 35mm DIN-rail (EN50022) PN:1802911

Technical data (Type 1/012.000.2)

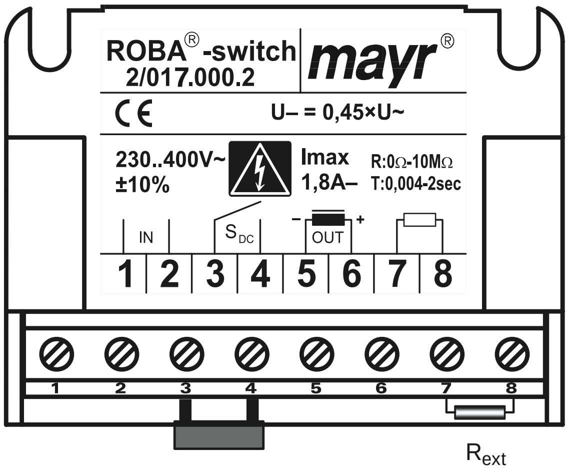
Supply voltage	230 VAC ±10 %, 50 Hz
Output voltage	52 VDC ±20 %
Output	max. 0,5 A / 100 % ED
Overexcitation - voltage	190 VDC
Overexcitation - time	150 ms ±20 %
Max. switching frequency	2 cycles/sec
Protection	IP 20
Terminal cross section	2,5 mm²
Ambient temperature	-40 °C up to +85 °C
Storage temperature	-40 °C up to +85 °C

Other types (on request):
1/012.001.2 SO - 230 VAC/450ms overexcitation time
2/012.001.2 SO - 400 VAC/450ms overexcitation time

Manufacturing declaration

The ROBA®-switch corresponds to the regulation of low voltage directives 73/23/EWG.
The safety regulations are to be observed.

Type 017.000.2 **Sizes 0-3**



Application

The ROBA®-switch are used to connect DC units to AC voltage supplies. For example: Electromagnetic brakes and clutches (ROBA-stop®, ROBA®-quick, ROBATIC®), also electromagnets, electrovalves etc.
An automatic switching between bridge connection and half-wave rectification allows:

a) to reduce the release time of the brake with overexcitation (bridge voltage), or
b) to reduce the power consumption of the brake with holding voltage (half-wave voltage).

Technical data:

AC-supply voltage	(Table 1)
Current load I_{eff}	(Table 1)
Protection	IP 10 resistor R_{ext} IP 20 terminal block IP 65 components, compound filled
Ambient temperature	-25 °C up to +45 °C -25 °C up to +70 °C with decreased current I_{eff} (Table 1)
Storage temperature	-25 °C up to +125 °C
Terminal cross section	max. 2,5 mm^2 (AWG 22-12)
Weight	103 g

Function:

The ROBA®-switch is provided for the operation with 115 - 500 U_{AC}-supply voltage. There is an internal switching from bridge to half wave rectification.
The output DC voltage is with

bridge rectification $U_{bridge} = 0,9 \times U_{AC}$ (VDC)
half-wave rectification $U_{half\ wave} = 0,45 \times U_{AC}$ (VDC)

The time of the brigde rectification is set to 450 ms (standard) at the factory and can be modified by exchange of the external resistor R_{ext} from 0,05 up to 2s.

ROBA®-switch-sizes

Table 1

sizes	U_{AC} supply voltage ± 10 % (VAC)	U_{bridge} output DC voltage (VDC)	$U_{half\text{-}wave}$ output DC voltage (VDC)	I_{eff} with ≤ 45 °C working temp. (Amp.)	I_{eff} with max. 70 °C working temp. (Amp.)	built-in varistors at DC and DC connections
0	115	104	52	2,0	1,0	275 V_{eff}
1	230	207	104	2,0	1,0	275 V_{eff}
2	230...400	207...360	104...180	1,8	0,9	550 V_{eff}
3	400...500	360...450	180...225	1,8	0,9	550 V_{eff}

ROBA®-switch permissible max. coil power

Note: The table gives reference values for a cycle frequency ≤ 1 cycle per minute and observance of the permissible current I_{eff} with ≤ 45 °C. (I_{eff} corresponds to $I_{max.}$ on the label of the ROBA®-switch).

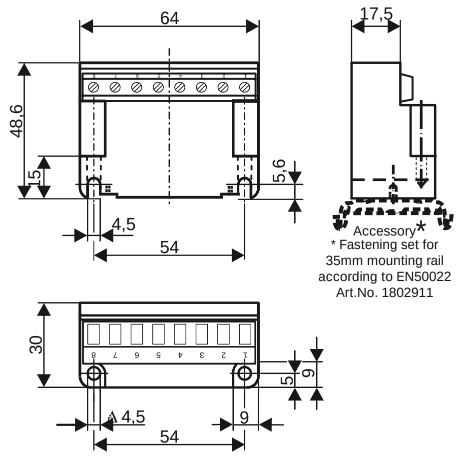
For an ambient temperature > 45 °C up to max. 70 °C the max. coil power is to be decreased.

Table 2

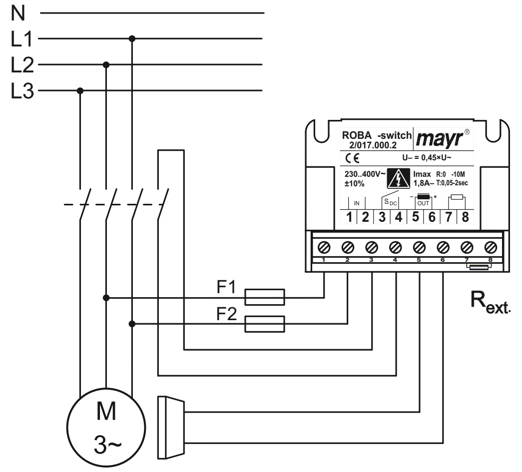
ROBA®-switch		max. permissible coil power											
U_{AC} (VAC)	size	with $coil_{NOM}$voltage 104 VDC			with $coil_{NOM}$voltage 180 VDC			with $coil_{NOM}$voltage 207 VDC			with $coil_{NOM}$voltage 225 VDC		
		≤ 45 °C	70 °C	Ind.	**≤ 45 °C**	70 °C	Ind.	**≤ 45 °C**	70 °C	Ind.	**≤ 45 °C**	70 °C	Ind.
115	0	**up to 410 W**	210 W	2)									
230	1	**up to 210 W**	105 W	1)	**up to 626 W**	313 W	3)	**up to 828 W**	414 W	2)			
	2	**up to 187 W**	93 W	1)	**up to 562 W**	281 W	3)	**up to 745 W**	372 W	2)			
400	2				**up to 324 W**	162 W	1)	**up to 428 W**	214 W	3)	**up to 506 W**	253 W	3)
	3				**up to 324 W**	162 W	1)	**up to 428 W**	214 W	3)	**up to 506 W**	253 W	3)
500	3										**up to 404 W**	202 W	1)

Ind.
1) operation with overexcitation
2) operation with reduced power consumption
3) operation with overexcitation and reduced power consumption

Dimensional diagram



Example for DC-switching



Order example:

To be included when ordering, please state:	size	type
Order number:		0 1 7 .0 0 0.2

sizes 0-3

Fuse F1 + F2

Type	power (Amp.)	dimension (mm)	breaking capacity
0/017.000.2	FF 5 A	5x20	H
1/017.000.2	FF 5 A	5x20	H
2/017.000.2	FF 4 A	6,3x32	H
3/017.000.2	FF 4 A	6,3x32	H

Spark quenching for installation into a terminal box

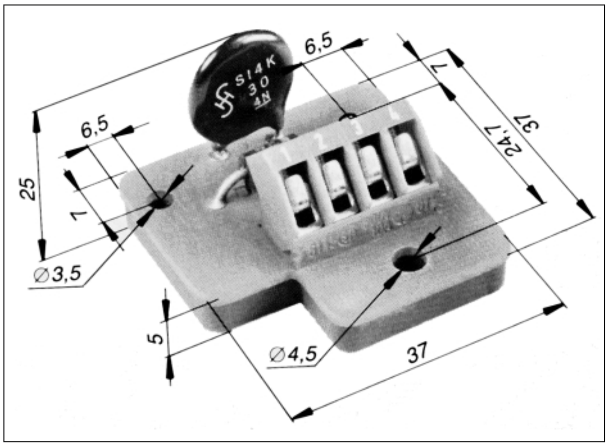
Application
- Reducing the spikes at the switching contacts in case of switching-OFF on the DC voltage side of inductive loads.
- Increasing of the service life of the protected switching contact.

Small constructional form which can be fitted into the *mayr*®-terminal box, into the switch cabinet, or into other housings.
- Suitable for DC voltage up to 300 VDC.
- Low priced spark quenching

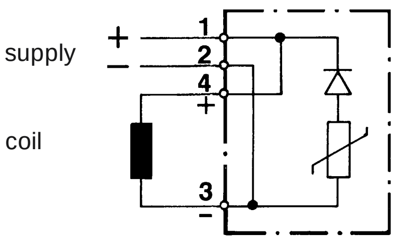
Function
There are high voltage spikes at the switching contact due to switching-OFF of inductive loads on the DC voltage side which can cause a consumption of the contact. This voltage spike at the switching contact is limited to approx. 40V by the varistor and, therefore, only a small breaking spark, unobjectionable for the switching contact, arises.

Design
The components of the spark quenching unit are installed on a printed card which is additionally encapsulated on the foil side of the board with a 5 mm thick resinous compound. The resinous compound enables the spark quenching unit to be screwed onto metallic bases without insulations (cap screw M4).

Technical data
Supply voltage max. 300 VDC voltage
Ambient temperature - 40 °C to + 85 °C.



Wiring diagram



Order example:

To be included when ordering, please state:	size	type
Order number:		0 7 0 . 0 0 0 . 0

Electrical connection via terminals with 4 channels

Terminal 1	(+) Supply voltage
Terminal 2	GND (-) Supply voltage
Terminals 3,4	Connection of the coil
Max. centimetre cube material which can be connected	1,5mm²

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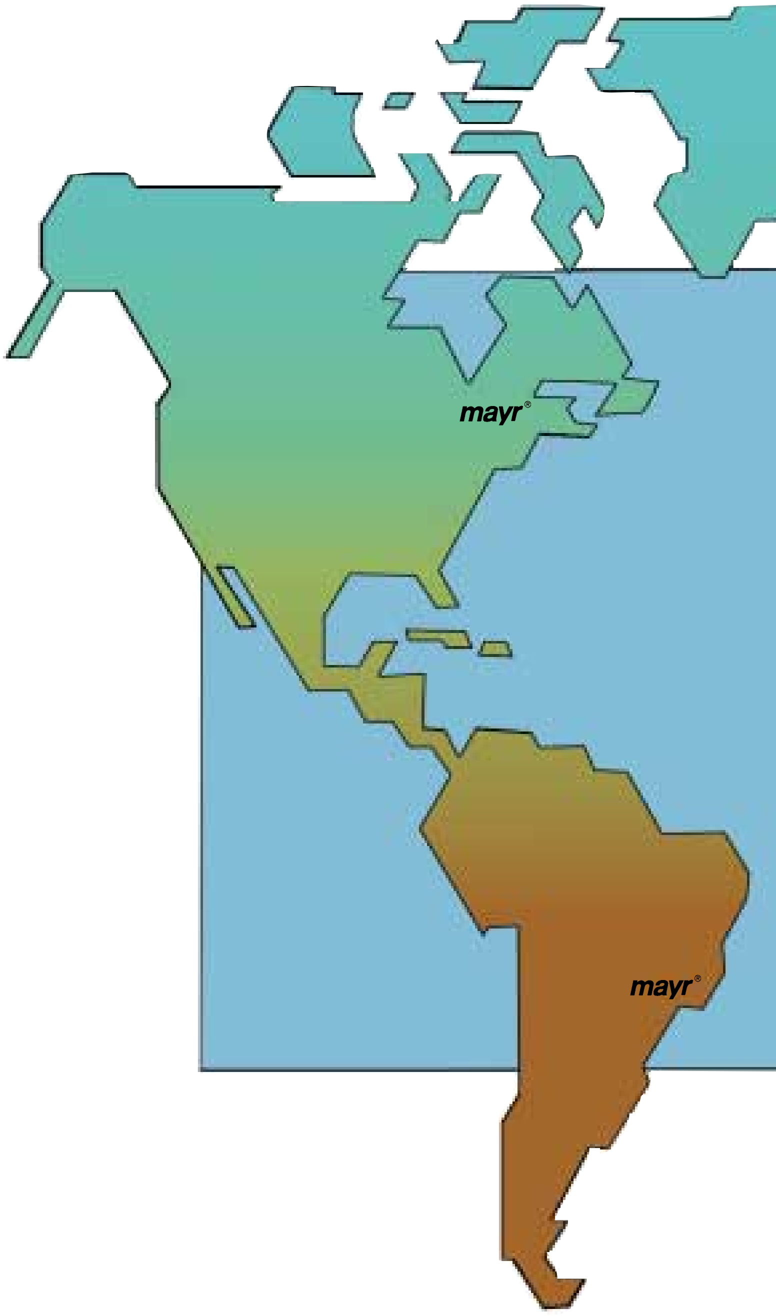
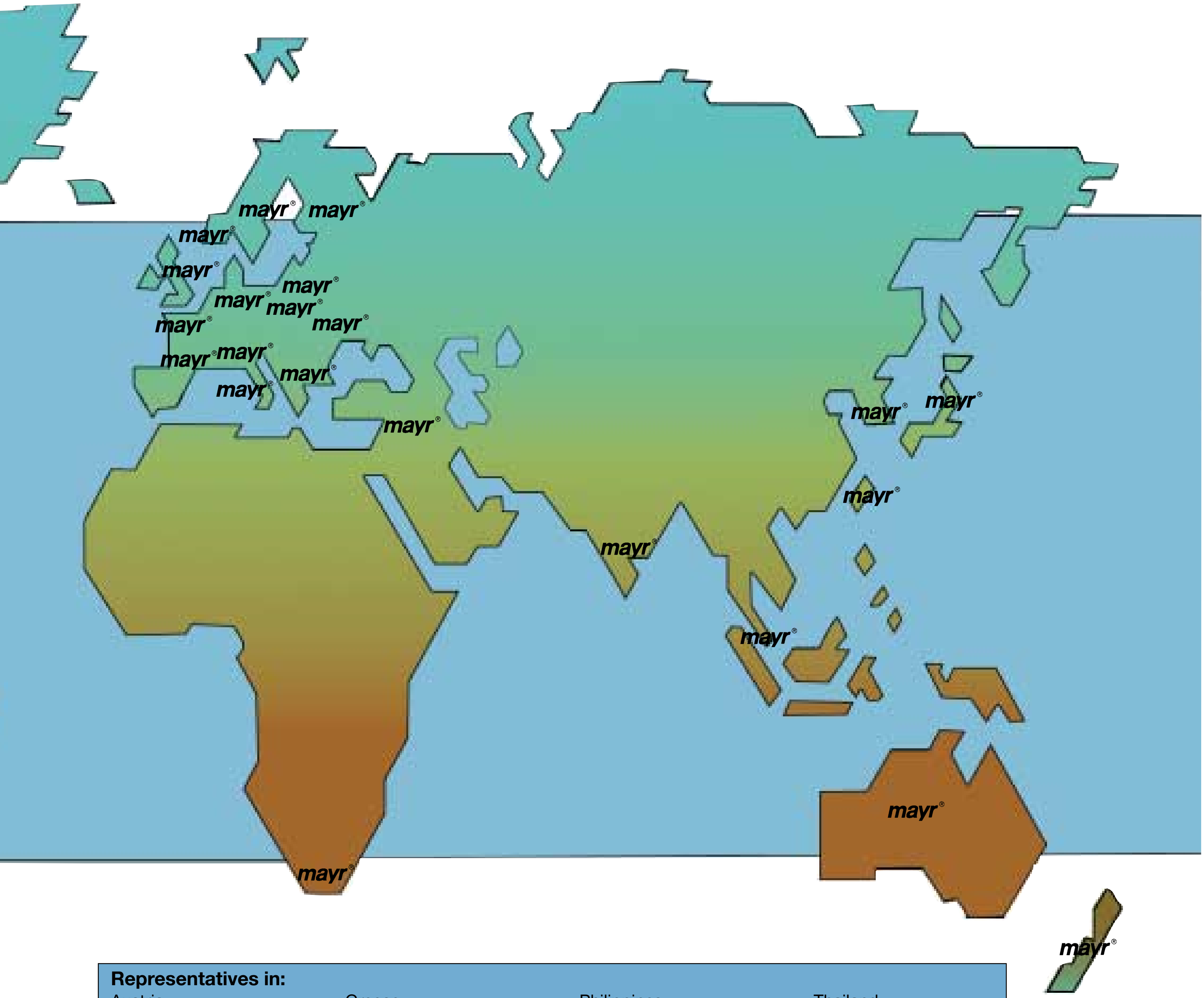


Worldwide representation



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Brazil	Hungary	Russia	
Canada	Indonesia	Slovakia	
Czech Republic	Israel	Slovenia	
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Finland	Norway	Sweden	

* Note: In case you don't find your country here, our headquarters is always prepared to advise you the agency responsible for you.

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Delivery Programme

Safety clutches/ torque limiters

- **EAS®-Compact/EAS®-NC**
  Backlash-free, positive safety clutches
- **EAS®-standard**
  Positive safety clutch with backlash
- **EAS®-overload/EAS®-elements**
  Modular overload clutch for heavy duty applications
- **EAS®-axial**
  Overload protection for linear movements
- **EAS®-Sp/EAS®-Sm/EAS®-Zr**
  Pneumatically or electromagnetically controlled torque limiting clutches with ON/OFF control
- **ROBA®-slip hubs**
  Load holding, friction type safety clutches

Shaft couplings

- **smartflex®**
  Precision shaft coupling for servo applications, direct drive systems and stepping motors
- **ROBA®-DX**
  Backlash-free, torsionally rigid flexible steel bellows coupling
- **ROBA®-ES**
  Backlash-free and flexible for vibratory critical drives
- **ROBA®-DS**
  Backlash-free, torsionally rigid and shock-proof all-steel flexible coupling
- **ROBA®-D**
  Backlash-free, torsionally rigid all steel flexible coupling

Electromagnetic brakes/clutches

- **ROBA-stop® safety brakes**
  Electromagnetic spring applied safety brakes
- **ROBA-stop®-M motor brakes**
  Electromagnetic spring applied safety brakes
- **ROBA-stop®-Z dual circuit fail safe brakes**
  Double security or double braking torque
- **ROBA®-quick brakes**
  Electromagnetic pole face brakes
- **ROBATIC®-clutches**
  Electromagnetic pole face clutches
- **ROBA®-takt**
  Clutch brake units

10/06/2002 ID

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Installation and Operating Instruction for ROBA-stop®-M Type 891._ _ _._

(B.8.1.GB)

Please read the operating instruction carefully and observe it in any case!
A possible malfunction or failure of the brake and possible damages can be caused by not observing.

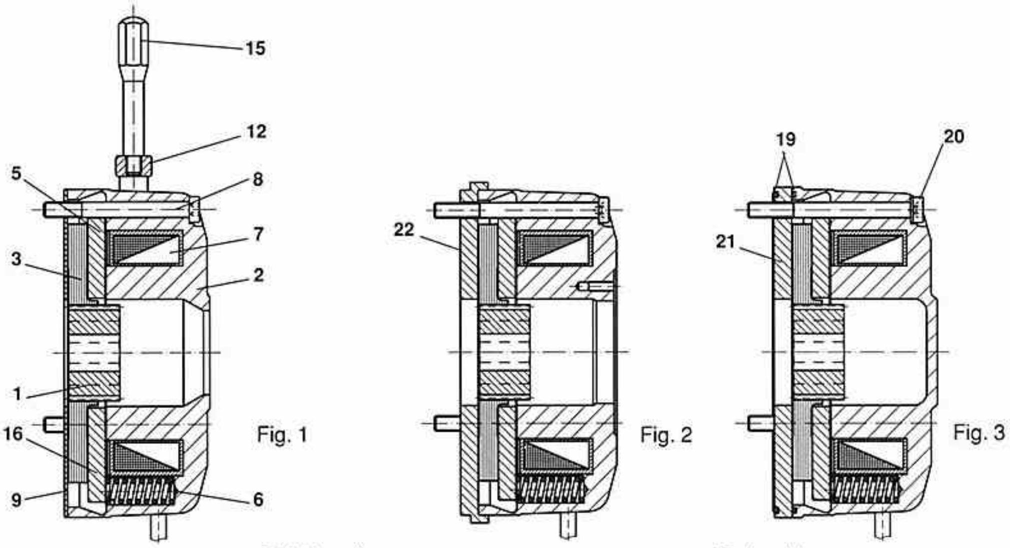

Fig. 1 Fig. 2 Fig. 3

Parts List

1 gear hub
2 coil carrier complete with coil (7)
3 rotor
5 armature disc
6 helical spring (torque)
7 coil
8 fixing screw
9 friction disc
10 helical spring (hand release)
11 threaded bolt
12 lever
13 washer
14 hexagon nut
15 hand release bar
16 shoulder screw
17 O-ring
18 distance plate
19 O-ring
20 flat packing
21 flange plate sealed
22 flange plate tacho brake

Assembly Conditions

- The eccentricity of the shaft end against the fixing hole P.C. must not exceed 0,2 mm.
- The positioning tolerance of the threads for the fixing screws (8) must not exceed 0,2 mm.
- The deviation of the concentric running of the screw-on surface with respect to the shaft must not exceed the true running tolerance acc. to DIN 42955. Out of square results in lower braking torque, permanent friction of the rotor and overheating.
- The fits from hub and shaft are to be selected in such a way that a widening in the toothing of the hub is not possible. A widening of the toothing causes a clamping of the rotor at the hub and following a functional problem of the brake (recommended hub - shaft fit H7/k6).
- Position the hub (1) in such a way that the toothing of the rotor (3) is fully supported.
- Rotor (3) and braking surfaces must be free of oil and grease. There has to be a suitable counter friction face (steel or cast iron Ra ≤ 3,2 µm). Sharp-edged interruptions of the friction face have to be avoided.

If there are not suitable counter friction faces made of steel of cast iron available, the brake type 891.__2/3._ (with friction plate (9)) or 891.__4/5._ (with flange plate) are to be used.

In case of brake usage with friction plate (Type 891.__2/3._) the stamp „friction side" on the friction plate must be observed.

1. Assembly

1.1 Mount gear hub (1) to the shaft **(observe the complete supporting length!!!)** and lock it axially (e. g. with a retaining ring).

1.2 Push rotor (3) manually onto the gear hub (1). An easy running of the toothing has to be observed. **No damage!**

1.3 Insert O-rings* (19) into coil carrier (2) and flange plate (21). **No damage!**

1.4 Attach the brake by means of the fixing screws (8) and the flat packings attached in the factory at the bearing bracket of the motor or at the machine wall **(tightening torques according to table 1 must be noticed).**
*** only for sealed design (Fig. 3)**

2. Braking Torque Adjustment

ROBA-stop®-M brakes are adjusted to torques, requested in the order in the factory. Various torque adjustments can be achieved by means of different spring configurations (6) in the coil carrier (2) (see Table 2).
The corresponding spring set (6) has to be requested in the factory by giving the brake size and the desired braking torque adjustment (acc. to Table 2).

Exchange of the helical springs (6):

For exchanging the helical springs (6) the brake must be dismantled from the motor bearing bracket or from the machine wall.

2.1 Remove fixing screws (8).

2.2 Unscrew shoulder screws (16) out of the coil carrier (2) and take off armature disc (5).
Attention: The helical springs (6) press against the armature disc (5). For removing the schoulder screws the armature disc must be pressed against the coil carrier (2) in order to avoid a prompt releasing of the helical springs. Observe mounting position of the armature disc or pay attention that the springs do not fall apart.

2.3 Exchange helical springs (**Attention!** The new helical spring set (6) must be put in always in a symmetrical arrangement).

2.4 Put armature disc (5) onto the coil carrier (2) or pressure springs respectively (observe mounting position, with sizes 2-60 use fixings screws (8) as centering aid), press armature disc against the spring force and screw in shoulder screw (16) until contact.

2.5 Attach brake at the motor bearing bracket or machine wall respectively by the aid of the fixing screws (8) **(observe tightening torques acc. to Table 1).**

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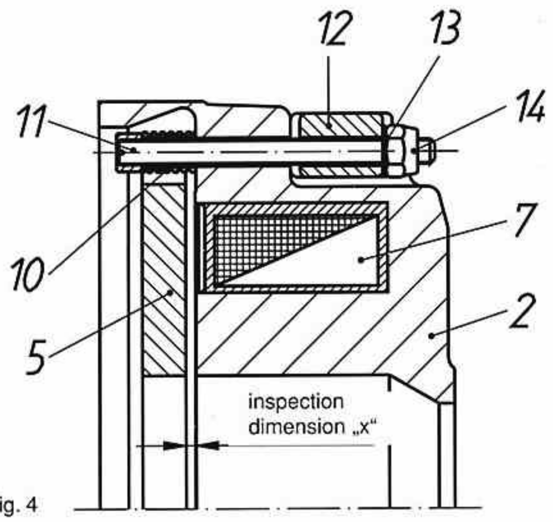

Fig. 4

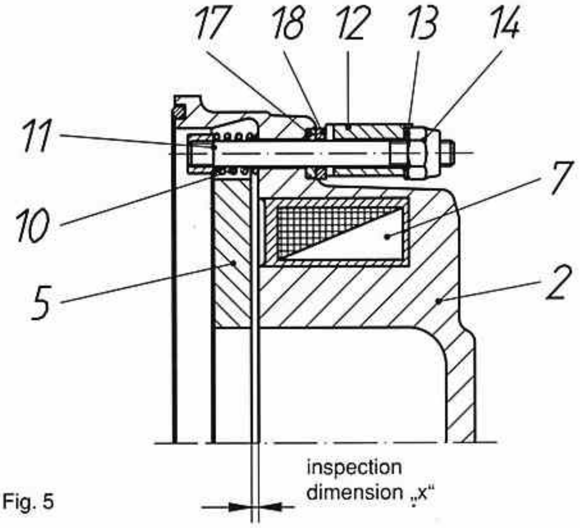

Fig. 5

3. Mounting the Hand Release (see figs. 1, 4 and 5)

The hand release can be installed only in an unscrewed condition of the brake.

Kind of procedure:

3.1 Unscrew the brake from the motor bearing bracket or machine wall.
3.2 Take out plastic plugs from the hand release bores in the coil carrier (2).
3.3 Push helical springs (10) onto hand release bolt (11).
3.4 Push hand release bolt (11) with helical springs (10) from the inside (view of direction onto coil (7)) into the hand release bores in the coil carrier (2).
3.5 * Push O-rings (17) over hand release bolt (11) and press them into the recesses of the coil carrier (2).
3.6 * Push distance plates (18) via hand release bolt (11).
3.7 Attach hand release bracket (12) and disc (13) and screw on selflocking nut (14) slightly.
3.8 Tighten both locking nuts (14) until the armature disc (5) contacts **uniformly** the coil carrier (2).
3.9 Unscrew both locking nuts (14) by „y" rotations (see Table 1), herewith the air gap between armature disc (5) and coil carrier (2) or the inspection dimension „x" is available again.
3.10 After installation of the ventilation cover screw in the hand release bar (15) into the hand release bracket (12) and tighten it.

*** The assembly items 3.5 or 3.6 refer to the hand release in a sealed design (IP 65) figure 5.**

4. Electric Connection

The coil voltage is indicated on the type tag. Additionally it is stamped on the brake or coil respectively.
D. C. current is necessary for the operation.
This one can be generated via Trafo-rectifier or half-wave/bridge connected rectifiers.
Switching can be made in DC current or AC current sides.
A faster connection time, however, is obtained by a switching in the DC side.
If a faster separation time is required, a special fast acting rectifier is necessary.
Please contact our company in this case.

When switching off electromagnetic units spikes may occur, which can cause damage to the units and must be damped.
Due to this damping the connection times indicated in the catalogue can be slower.
Protection of the voltage supply according to the power values must be provided.
The brakes are designed for a relative switch-on period of 100%.

Size	Dimension to be checked „x" [mm]	Number of rotations „y"	Fixing screws (8)				Tightening torques for fixing screws (8) [Nm]
			Type 891.__0._	DIN	Type 891.__4._	DIN	
M 2	$0{,}9^{+0{,}1}$	1,5	3 x M 4 x 45	6912	3 x M 4 x 50	912	2,5
M 4	$0{,}9^{+0{,}1}$	1,5	3 x M 4 x 45	6912	3 x M 4 x 50	912	2,5
M 8	$1{,}1^{+0{,}1}$	1,5	3 x M 5 x 50	6912	3 x M 5 x 55	6912	5,0
M 16	$1{,}6^{+0{,}1}$	2,0	3 x M 6 x 60	6912	3 x M 6 x 65	6912	9,0
M 32	$1{,}8^{+0{,}1}$	2,0	3 x M 6 x 60	6912	3 x M 6 x 70	912	9,0
M 60	$2{,}2^{+0{,}1}$	2,0	3 x M 8 x 75	6912	3 x M 8 x 85	912	22
M 100	$2{,}2^{+0{,}1}$	1,6	3 x M 8 x 80	912	3 x M 8 x 90	912	22
M 150	$2{,}2^{+0{,}1}$	1,6	3 x M 8 x 100	912	3 x M 8 x 110	912	22
M 250	$2{,}4^{+0{,}1}$	1,5	3 x M 10 x 110	912	3 x M 10 x 130	912	45

Table 1

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5. Brake inspection

The brake torque (catalogue value) is only achieved after the run-in process has been carried out.

The brake torque (switching torque) is the slipping torque acting on the shafting at a running speed of 1 m/s refered to the mean friction radius (acc. to DIN VDE 0580/10,94).

6. Maintenance

ROBA-stop®-M brakes nearly don't require any maintenance.

The rotor, however, is a part which can be worn down.

The rotor is robust and wear resistant and hereby a very long service life of the brake is obtained.

In case, however, the rotor is worn out due to a high friction work and, therefore, the function of the brake is not guaranteed any more, the brake can be brought again to its original condition by changing the rotor.

The wear condition of the rotor is determined by checking the release voltage.

The release voltage may only amount to max. 90% of the nominal voltage for a warm brake.

Exchange of the rotor (3):

For exchanging the rotor (3) the brake must be unscrewed from the motor bearing bracket or machine wall.

6.1 Remove fixing screws (8).

6.2 **Clean brake.**
Procedure as described under points 2.2 and 2.4.
Remove abrasion by the aid of air pressure.

6.3 Pull off rotor (3) from hub (1).

6.4 Check armature disc (5) on plane-parallelity and wear (strong coring must not exist). Exchange armature disc if necessary (procedure as described under points 2.2 and 2.4).

6.5 Check rotor thickness of the new rotor (3) and compare data with the values mentioned in Table 2.

6.6 Push rotor (3) onto hub (1) and check as to radial play. If there is clearance in the toothing between hub (1) and rotor (3), pull off the gear hub from the shaft and replace it.

6.7 Attach brake by means of the enclosed fixing screws (8) **(observe tightening torques acc. to Table 1).**

Attention!!
For brakes with reduced braking torque and/or an operation with fast acting rectifier the braking function is not guaranteed any more after the friction linings are worn down.

Table Braking Torque Adjustment

Size		M 2	M4	M8	M16	M32	M60	M100	M150	M250
Braking torque adjustments [Nm]	Holding brake	4	8	16	32	64	100	180	250	450
	Standard brake	2,5	5	10	20	40	75	125	185	312
		2,2	4,5	9	18	36	68	110	165	280
		2	4	8	16	32	60	100	150	250
		1,7	3,4	6,8	13,5	27	51	85	125	215
		1,4	2,8	5,5	11	22	42	70	100	180
		1	2	4	8	16	30	50	75	125
		0,7	1,4	2,8	5,5	11	21	35	50	90
Rotor thickness „new“		6,05	6,05	6,9	8	10,4	11,15	14	15,5	17

Table 2

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Breakdowns

Failures	Possible reasons	Remove
Brake does not release	❑ False voltage measured at the rectifier ❑ Rectifier failed ❑ Air gap too big (rotor worn down) ❑ Coil interrupted ❑ Brake is getting too warm	❑ Apply correct voltage ❑ Exchange rectifier ❑ Renew rotor ❑ Exchange brake ❑ Use fast acting rectifier
Brake does not brake	❑ Hand release is adjusted falsely ❑ Hand release play or clearance of the shoulder screw is not available any more; (possible with decreased torque or operation with fast acting rectifier)	❑ Adjust distance correcty ❑ Exchange rotor
Brake engages with delay	❑ Brake is switched to A. C. side	❑ Switch to D. C side

General statements regarding security

- ❑ The brakes may only be connected to kind and value of voltages acc. to the type tag.
- ❑ When repairing or servicing the unit, you have to pay attention that the brake is not energized.
- ❑ Maintenance work and repairs may only be made by skilled labours.
- ❑ Current-carrying parts must not get in contact with water
- ❑ If brakes are not used according to their designation, we don't overtake any liability for any damages (The user is responsible for the correct and safe usage).

Following protective arrangements are to be made by the user:

- ❑ against any danger due to heating of the unit.
- ❑ against any danger due to moving parts (squeezing, taking hold of).
- ❑ against any danger due to electrical shock (earthing of the units by conducting connection with earthed machinery parts).

Protection class ot the units:

Protection class I acc. to DIN VDE 0580/10.94

Conformation explanation (acc. to art. 10; 73/23/EWG):

CE

The brakes are developed and manufactured in conformance with the national standard DIN VDE 0580 according to the regulations of the low-voltage recommendations of the EG of 10.02.73.
They are determined for fitting into a machine in the supplied design and that it must not be put into service as long as it has been determined that the machine in which this product (unit) should be installed corresponds the regulations of the EEC directives. The observance of the EMV-regulations 89/336/EWG must be guaranteed by the applicant.

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