ROBATIC®, ROBA-quick® ROBA®-takt

Electromagnetic Clutches and Brakes, Clutch Brake Units

K.500.V10.EN

www.mayr.com

mayr® - your reliable partner

What is your definition of reliability?

We define reliability as the highest product quality and competent service from the initial contact right up to the after-sale service

- Largest variety in selection of standard products
- Market leader's competence arising from decades of experience in the development, production and application of power transmission products
- Optimum product selection due to our expertise in design and calculation
- Reliable component dimensioning
- Intelligent platform (modular construction)
- High flexibility for individual requests and customer-tailored solutions
- Quality-inspected suppliers
- Modern, highly robust materials
- In-house production
- 100% quality control
- Certified according to DIN EN ISO 9001
- Personal supervision from the first contact right up to the after-sale service
- Worldwide local service network
- CAD-files available online to save time and costs during construction
- 24-hour delivery service for preferred products
- Short delivery times and on-time delivery
- Unlimited replacement part availability worldwide

Your advantages when using electromagnetic ROBATIC®-clutches, ROBA®-quick brakes and ROBA®-takt clutch brake modules

● Easy integration into your machine:

The optimised magnetic circuit minimises the magnetic leakage flux. The high performance density and torque security based on it allow compact dimensions and an easy integration in your construction.

● High reliability and operational safety:

The switching behaviour is constant during the entire service lifetime. Therefore, the positioning accuracy and reliability of the clutches or brakes respectively and herewith the operational safety of your machine are increased.

● Less operating expenses and maintenance charges:

The large friction surface and the smooth switching behaviour increase the wear resistance. Therefore, the clutches and brakes are maintenance-free until wear limit of the friction surfaces. There is no re-adjustment work and the resulting operational interruptions. Therefore, the operating expenses and maintenance charges are very low.

● Increase of productivity:

Short switching times allow high switching frequencies and increase the productivity of your machine.

Total Quality Management

Product Quality

Every delivery which leaves our firm has been subjected to a careful quality inspection, meaning that you are able to rely 100 % on *mayr*® products. If required, we pre-adjust our clutches and brakes accurately to the requested values and confirm the **product characteristics with an Inspection Report.**

Quality Management

mayr® uses the term quality to describe its products and services. Certification of our quality management confirms the quality-consciousness of our colleagues at every level of the company.

Our integrated management system is certified according to **DIN EN ISO 9001:2000 (Quality)** and **DIN EN ISO 14001 (Environment)** and complies with the **OHSAS 18001/OHRIS (Occupational Health and Safety)** demands.

ZERTIFIKAT

Chr. Mayr GmbH + Co. KG

ISO 9001 : 2008

IQNet

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

Chr. Mayr GmbH + Co. KG

ISO 14001 : 2004 + Cor 1 : 2009

All products are subject to comprehensive investigations and tests regarding loads. Only after having passed the strongest long-time tests and when they fully meet all the technical requirements and proof their reliability they are included in our delivery programme.

Electromagnetic clutches and brakes – Guidelines

Description and operating conditions

1. The catalogue values, in particular the values for the nominal torque, are reference values and may deviate in individual cases.
2. During dimensioning, please contact the manufacturers for consultation on installation conditions, torque fluctuations, permitted friction work, run-in behaviour, wear and ambient conditions.
3. The clutches and brakes are designed for dry running. If the friction surfaces come into contact with oil, grease or similar substances, there may be a severe decrease in torque.
4. When the devices are switched off, voltage peaks may occur due to the counter-induction on the magnetic coils, causing in extreme cases damage to the magnetic coil and therefore to the components. For this reason, excess voltage must be damped using a suitable "protection circuit" (e.g. using a varistor).
5. The surfaces on the clutches and the brakes are corrosion-resistant except for the friction surfaces. However, in operation in extreme ambient conditions or in outdoor conditions with direct weather influences, additional protective measures are necessary.
6. The connection cable or connection strands on the clutches and brakes have a surface coating which is not resistant against all influences. After contact with chemical substances, please check compatibility.
7. The clutches and brakes are designed for a relative duty cycle of 100 %.

Torque characteristics

In new condition, approx. 50 % of the catalogue nominal torque (M_2) is transmitted.

The components reach the catalogue nominal torque when the friction surfaces are run in. As a rough guideline value, approx. 100 – 200 switchings in dynamic operation, a typical speed of approx. 500 to 1000 rpm and a medium friction work (see Table 1) can be given.

Longer slipping of the clutch or brake is to be avoided, especially at low speeds, as this can cause scoring formation and therefore damage to the friction surfaces. Clutches or brakes used in static or virtually static operation do not reach the nominal torque (M_2).

If requested, the clutches or brakes can also be run in at the place of manufacture. This is most expedient for Type 540.140 with complete bearing.
However, Types 500.1_ _ and 520.1_ _ can also be run in under certain conditions. For this, please ensure exact installation customer-side according to the specification in order to reproduce the friction conditions as precisely as possible. At the same time, the "friction carbon" produced must not be rubbed off. If the clutches are run in to the nominal torque at the place of manufacture and then operated in static or virtually static mode, please allow for a drop to approx. 60 – 70 % of the nominal torque. This is the case if the clutch or brake falls below the speed or friction work (Q_a) stated in Table 1.
For static and virtually static applications, we therefore recommend our "double-flow designs", Type series 500.3_ _.0 (see pages 12/13).

Size	Friction work Q_a [J]	Clutch or brake speed $n_{min.}$ [rpm]
3	16	300
4	29	250
5	55	200
6	105	160
7	200	130
8	380	120
9	600	100

Table 1

Run-in conditions

For running in, different procedures can be used according to the Type design. An "artificial" run-in is to be carried out if a run-in procedure is not possible in the machine due to the type of application (see Section "Torque Characteristics"), e. g. due to insufficient friction work, speed or switching frequencies.

For the run-in conditions of the individual clutch and brake types, please see the respective Installation and Operational Instructions on our website ***www.mayr.com***

Electrical connection and wiring

DC current is necessary for the operation of the clutch or brake. The coil voltage is indicated on the Type tag as well as on the brake body and is designed according to the DIN IEC 60038 (±10 % tolerance). Operation can take place with alternating voltage using a rectifier or another suitable DC power supply. 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!

Electrical wiring

24 VDC and 104 VDC can be selected as standard voltages.
24 VDC: Operation with a mains adaptor of 24 VDC
104 VDC: Half-wave rectifier with 230 VAC mains voltages

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!

Device fuses

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

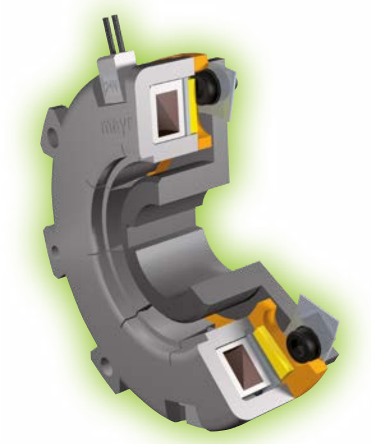
Protection circuit

When using DC-side switching, the coil must be protected by a suitable protection circuit according to VDE 0580. This is achieved by using a sufficiently dimensioned varistor, which has already been integrated into the ***mayr*® rectifier.** 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 operation current are sufficient. Depending on the application, the switching contact can also be protected by other protection circuits (e.g. ***mayr*® spark quenching units**), although this may of course then alter the switching times.

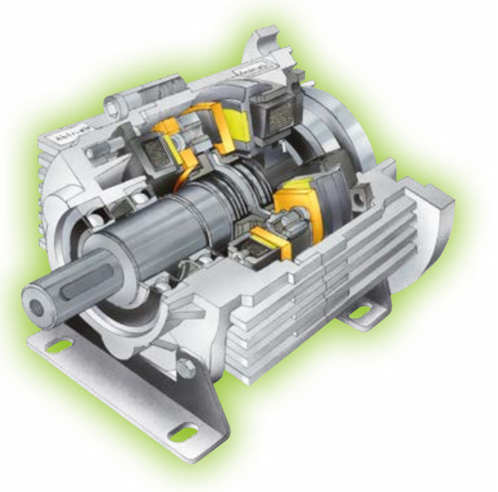
Electromagnetic clutches and brakes

ROBATIC®
Electromagnetic, 'energise to engage' pole face clutches

ROBA®-quick
Electromagnetic, 'energise to engage' pole face brakes

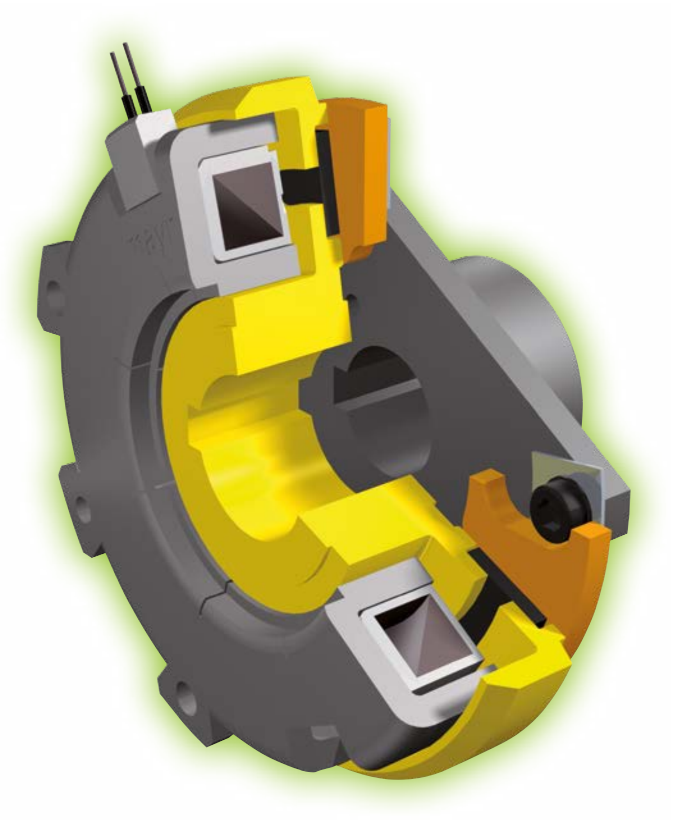


ROBA®-takt clutch brake module
Clutch brake unit



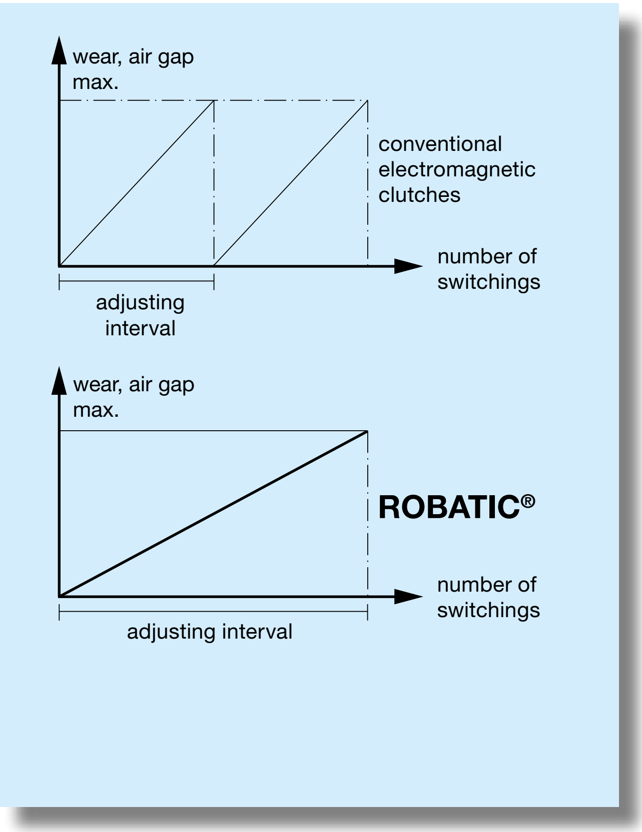
Contents

ROBATIC®-electromagnetic clutch



Constant switching performance throughout the entire service lifetime

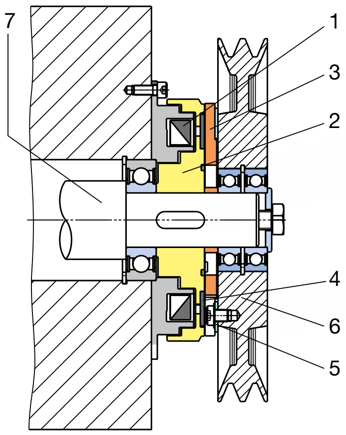
- ❑ **High torque security**
  due to an optimised magnetic circuit and the new design of the ROBATIC®. Therefore higher capacities due to less magnetic leakage flux.
- ❑ **Half the wear**
  due to large friction surfaces and smooth switching behaviour, the ROBATIC® has a higher wear resistance (approx. 100 %)
- ❑ **Large internal diameters of the magnetic coil bodies**
  therefore large permitted shaft diameters
- ❑ **Low-noise**
- ❑ **Short switching times/high switching frequencies**
- ❑ **Correct function up to wear limit**



Functional principle

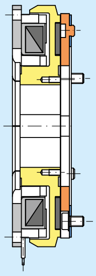
ROBATIC®-clutches are 'energise to engage', electromagnetic pole face units.
When DC voltage is applied to the magnetic coil (1), a magnetic field is built up. The armature disk (3) is attracted to the rotor (2) with friction lining (4). The torque is transmitted via frictional locking.

The torque is transmitted from the drive element (6) via the armature disk (3) and the rotor (2) to the output shaft (7). After having de-energised the coil, the membrane spring (5) draws back the armature disk (3) to the drive element (e.g. belt pulley), and the torque transmission is then disconnected.



Summary of constructional designs ROBATIC®

ROBATIC® standard



Sizes 3 to 9 Type 500._ _ _._			
Sizes 3 to 7 Type 500.20_.0	without accessories with flange hub	Type Type	500.200.0 500.201.0
Sizes 8 to 9 Type 500.1_ _	without accessories with flange hub	Type Type	500.10_ 500.11_

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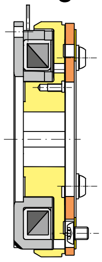
ROBATIC® double-flow design



Sizes 3 to 7 Type 500.30_	without accessories with flange hub	Type Type	500.300.0 500.301.0

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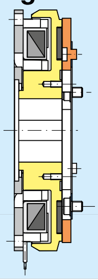
ROBATIC® small mounting diameter



Sizes 3 to 7 Type 500.21_.0	without accessories with flange hub	Type Type	500.210.0 500.211.0
Sizes 8 to 9 Type 580.1_0 with small bolt circle	without accessories with flange hub	Type Type	580.100 580.110

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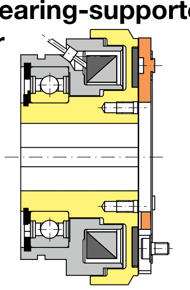
ROBATIC® with bearing-supported coil carrier



Sizes 3 to 9 Type 540.1_ _	without accessories with flange hub	Type Type	540.10_ 540.11_

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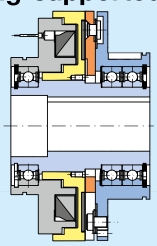
ROBATIC® with bearing-supported flange



Sizes 3 to 9 Type 540.14_		Type	540.14_

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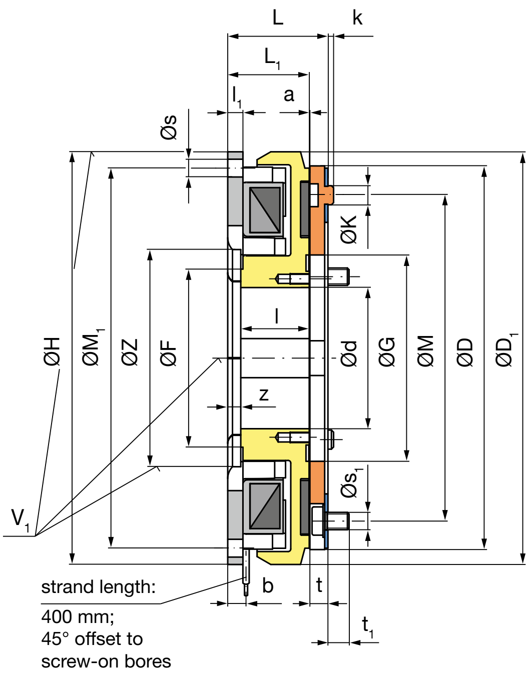
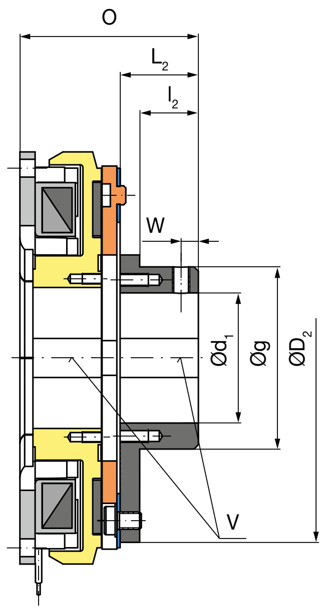
ROBATIC®-electromagnetic clutch

Standard **Sizes 3 – 7** **Type 500.20_.0**



Type 500.200.0
Standard



Type 500.201.0
Standard with flange hub

Order number

__ / 5 0 0 . 2 0 __ . 0 / __ / __ / __ / __

Size			Coil voltage	Rotor	Flange hub	Keyway
3	without accessories	**0**	[VDC]	bore	bore	acc.
to	flange hub	**1**	**24**	Ø d H7	Ø d_1 H7	DIN 6885/1
7			**104**			or DIN 6885/3

Example: 6 / 500.201.0 / 24 / 35 / 40 / DIN 6885/1

Standard **Sizes 3 – 7** **Type 500.20_.0**

Technical data

Technical data				Size 3	Size 4	Size 5	Size 6	Size 7
Nominal torque [1]	Type 500.20_.0	M_2	[Nm]	10	20	45	80	160
Electrical power		P_{20}	[W]	18	26	37	53	79
Maximum speed		n_{max}	[rpm]	8600	7000	6100	5800	4500
Weight	without accessories	m	[kg]	0.68	1	2.15	3.48	6.6
	with flange hub	m	[kg]	0.75	1.31	2.35	4.03	7.5
Mass moment of inertia	Rotor [2]	I_{eig}	[10^{-4} kgm²]	2	5.14	13.25	29.85	86.75
	Armature disk	I_{eig}	[10^{-4} kgm²]	0.76	1.92	6.86	17.56	52.86
	Flange hub [2] + Armature disk	I_{eig}	[10^{-4} kgm²]	1.02	2.75	8.63	24.66	70.63

1) Please observe run-in conditions or minimum speed (see page 4).
2) With max. bore

Standard voltages 24 VDC; 104 VDC.
Permitted voltage tolerances acc. IEC 38 +/-10 %.

Bores

Bores			Size 3	Size 4	Size 5	Size 6	Size 7
Ød H7	Preferred bores	[mm]	10; 15	17; 20	20; 25; 30	25; 30; 35	30; 40; 50
	min.	[mm]	9	11	13	13	20
	max.	[mm]	25	35	42	55	65
Ød_1 H7	Preferred bores	[mm]	17; 20	20; 25	25; 30	30; 40	40; 50
	min.	[mm]	9	13	15	20	23
	max.	[mm]	20	30	35 [3]	45	60

3) Up to Ø 32 keyway acc. DIN 6885/1, over Ø 32 keyway acc. DIN 6885/3

Dimensions [mm]

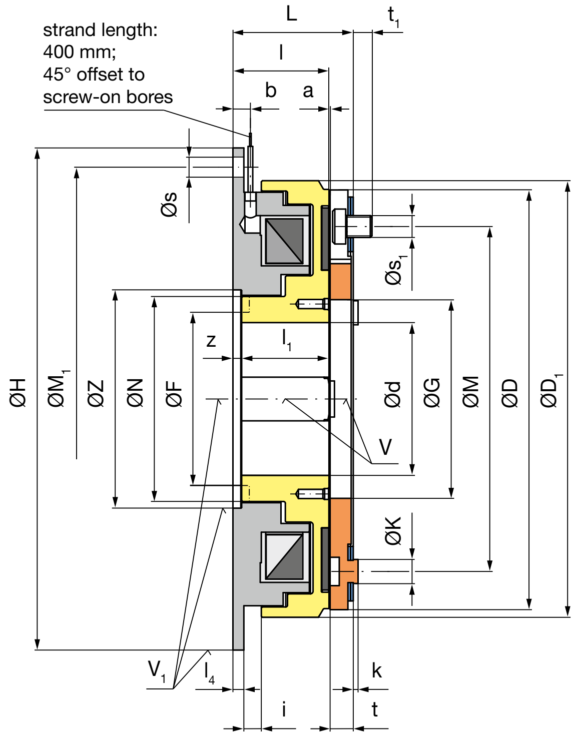
Dimensions [mm]	Size 3	Size 4	Size 5	Size 6	Size 7
a	0.2	0.2	0.2	0.3	0.3
b	4.5	4	5.5	5.5	7.5
D	73.5	92	115	140	177
D_1	80	100	125	150	190
D_2	70	88	110	140	170
F	33	41.5	47	63	82
G	36	49	57.5	74	95
g	29.5	44	47	66	84
H_{h9}	80	100	125	150	190
K	3 x 4.6	3 x 6.4	3 x 7.0	3 x 10.4	3 x 10.2
k	1.7	2.3	2.7	2.8	2.7
L	28.1	31.2	36.0	40.8	46.1
L_1	24	26.5	30	33.5	37.5
L_2	20	22	28	32	36
l	20.5	22	25	27.5	31.5

Dimensions [mm]		Size 3	Size 4	Size 5	Size 6	Size 7
l_1		3.5	4.3	5.2	6	7
l_2		16	17	22	25	27
M		60	76	95	120	150
M_1		72	90	112	137	175
O		48.1	53.2	64.1	72.9	82.2
s		4 x 4.8	4 x 5.7	4 x 6.8	4 x 6.8	4 x 9.2
s_1		3 x M4	3 x M5	3 x M6	3 x M8	3 x M8
t		3.9	4.5	5.8	7.0	8.3
t_1		5.2	7.2	8.7	8.0	9.7
Permitted shaft misalignm. and centre offset	**V**	0.05	0.05	0.05	0.05	0.1
	V_1	0.1	0.15	0.15	0.15	0.2
W		5	5	6	8	8
Z^{H8}		42	52	62	80	100
z		3.5	4.5	5	6	6

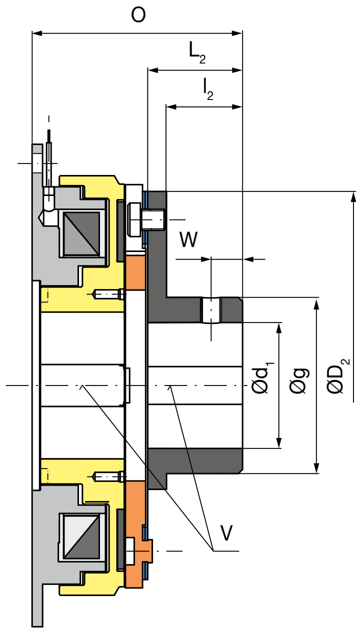
We reserve the right to make dimensional and constructional alterations.

ROBATIC®-electromagnetic clutch

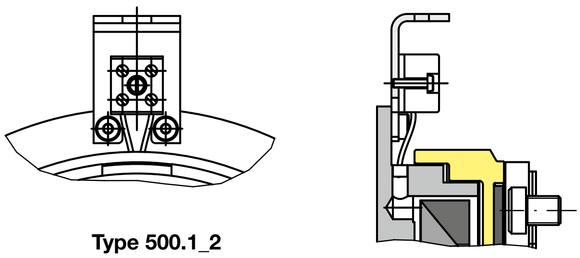
Standard **Sizes 8 – 9** **Type 500.1_ _**



Type 500.100
Standard
with connection strand



Type 500.110
Standard with flange hub
with connection strand



Type 500.1_2
Standard
with connection terminal

Order number

without accessories	**0**
flange hub	**1**

_ _ / 5 0 0 . 1 _ _ _ _ / _ _ / _ _ / _ _ / _ _

Size			Coil voltage [VDC]	Bore Rotor [3] Ø d^{H7}	Bore flange hub Ø d_1^{H7}	Keyway acc.
8	connection strand	**0**	**24**			DIN 6885/1
9	connection terminal	**2**	**104**			or DIN 6885/3

Example: 8 / 500.100 / 24 / 40 / DIN 6885/1

Technical data				Size 8	Size 9
Nominal torque [1)]	Type 500.1_ _	M_2	[Nm]	320	640
Electrical power		P_{20}	[W]	61	82
Maximum speed		n_{max}	[rpm]	3000	2200
Weight	without accessories	m	[kg]	10.1	20.5
	with flange hub	m	[kg]	13	25
Mass moment of inertia	Rotor [2)]	I_{eig}	[10^{-4} kgm²]	165	450
	Armature disk	I_{eig}	[10^{-4} kgm²]	81	315
	Flange hub [2)] + Armature disk	I_{eig}	[10^{-4} kgm²]	107	381

1) Please observe run-in conditions or minimum speed (see page 4).
2) With max. bore

Standard voltages 24 VDC; 104 VDC.
Permitted voltage tolerances acc. IEC 38 +/-10 %.

Bores			Size 8	Size 9
Ød ^{H7}	Preferred bores	[mm]	40; 50; 60	50; 60; 70
	min.	[mm]	24	34
	max.	[mm]	70	80
Ød$_1$ ^{H7}	Preferred bores	[mm]	40; 50	50; 60
	min.	[mm]	24	27
	max.	[mm]	60	80

Dimensions [mm]	Size 8	Size 9
a	0.5	0.5
b	8	9
D	193	251
D_1	200	251
D_2	185	242
F [3)]	-	-
G	91	111
g	84	104
H_{h9}	230	290
i	8	9.5
K	3 x 11	4 x 20
k	2	4.2
L	55.1	63.9
L_2	45.3	53.9
l	44	51
l_1	40	47

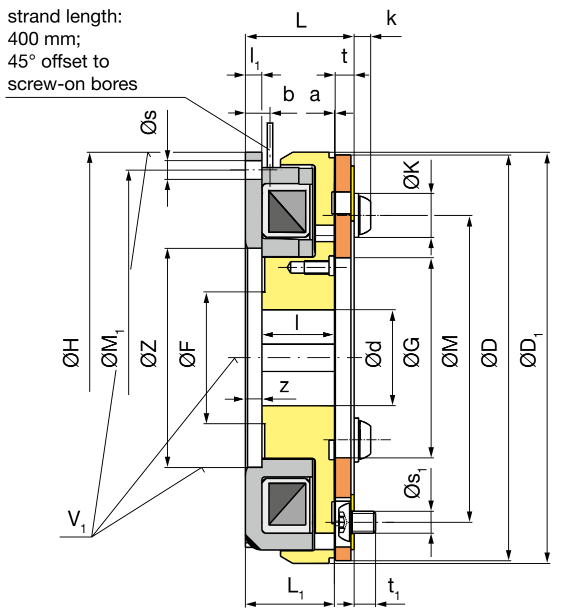
Dimensions [mm]		Size 8	Size 9
l_2		36.3	42.9
l_4		5	6
M		158	210
M_1		215	270
N		93.9	116.8
O		100.4	117.8
s		4 x 9	4 x 11
s_1		3 x M10	4 x M12
t		10.6	12.4
t_1		8.5	11.8
Permitted shaft mis-alignm. and centre offset	**V**	0.1	0.1
	V_1	0.2	0.25
W		15	20
Z^{H8}		100	125
z		4	4

3) Turning for RS-ball bearing according to customer specifications – no turning is allowed for in the standard range.

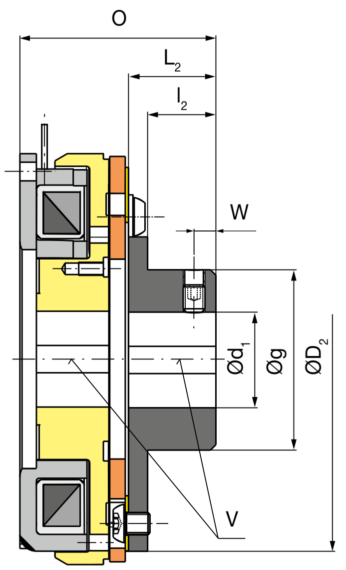
We reserve the right to make dimensional and constructional alterations.

ROBATIC®-electromagnetic clutch

Double-flow design **Sizes 3 – 7** **Type 500.30_.0**



Type 500.300
Double-flow design



Type 500.301
Double-flow design with flange hub

Performance Characteristics

- **Preferred for static or virtually static applications**
- **High torque security with low friction work**
- **No organic friction lining installed (environmentally friendly)**

Order number

__ / 5 0 0 . 3 0 __ . 0 / __ / __ / __ / __

Size 3 to 7	without accessories flange hub	**0** **1**	Coil voltage [VDC]	**24** **104**	Rotor bore Ø d H7	Flange hub bore Ø d_1 H7	Keyway acc. DIN 6885/1

Example: 6 / 500.301 / 24 / 35 / 40

Technical data				Size				
				3	4	5	6	7
Nominal torque [1) 2)] (+50% /-12%) Type 500.30_.0		M_2	[Nm]	20	40	90	160	320
Electrical power		P_{20}	[W]	17	25	37	50	79
Maximum speed [3)]		n_{max}	[rpm]	8600	7000	6100	5800	4500
Weight	without accessories	m	[kg]	0.65	1.16	2.02	3.3	6.22
	with flange hub	m	[kg]	0.76	1.5	2.53	4.46	8.09
Mass moment of inertia	Rotor [4)]	I_{eig}	[10^{-4} kgm²]	2.02	5.56	14.08	32.26	106.36
	Armature disk	I_{eig}	[10^{-4} kgm²]	1.08	2.69	7.34	19.92	61.57
	Flange hub [4)] + Armature disk	I_{eig}	[10^{-4} kgm²]	1.46	3.98	10.26	30.43	89.01

1) Please observe run-in conditions or minimum speed (see page 4).
2) During permanent synchronisation without friction work, the torque may drop to 50 % - 60 % of the nominal torque.
3) Max. switching speed is dependent on friction work and switching frequency - ***if necessary, please contact the manufacturer.***
4) With max. bore

Standard voltages 24 VDC; 104 VDC.
Permitted voltage tolerances acc. IEC 38 +/-10 %.

Bores			Size				
			3	4	5	6	7
Ød [H7]	Preferred bores	[mm]	15, 20	20, 25, 28	30, 35, 40	45, 50	55, 60
	min. [5)]	[mm]	14	19	30	42	55
	max.	[mm]	25	35	42	55	65
Ød_1 [H7]	Preferred bores	[mm]	15, 17, 20	20, 25, 28	25, 30	35, 40, 45	50, 55, 60
	min. [5)]	[mm]	14	19	24	32	50
	max.	[mm]	20	30	32	45	60

5) For torques smaller than the nominal torque M_2, bores below d_{min} are possible on request.

Dimensions [mm]	Size				
	3	4	5	6	7
a	0.2	0.2	0.2	0.3	0.3
b	4.5	4	5.5	5.5	7.5
D	79	99	123.5	148	188
D_1	80	100	125	150	190
D_2	70	88	110	140	170
F [6)]	-	-	-	-	-
G	32	49	55	73	95
g	29.5	44	47	66	84
H_{h9}	80	100	125	150	190
K	3x8	3x10	3x12	3x16	3x14
k	3.2	3.8	4.3	6	4.4
L	28.1	31.25	35.7	40.7	46.1
L_1	23.5	26.5	30	33.5	37.5
L_2	20	22	28	32	36
l	20	22	25	27.5	31.5

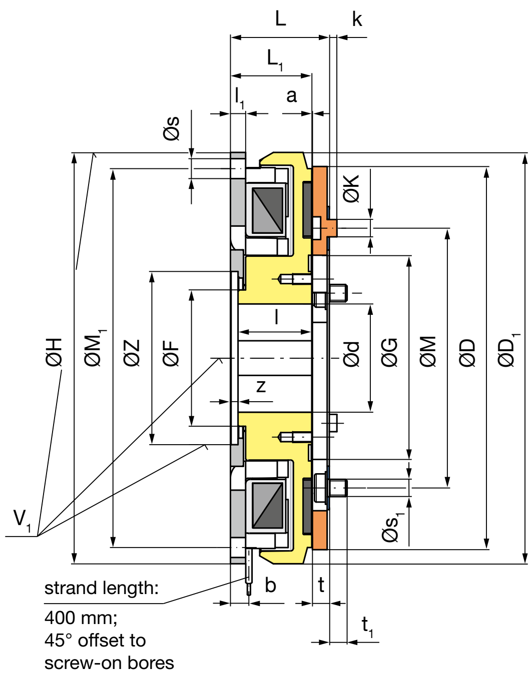
Dimensions [mm]		Size				
		3	4	5	6	7
l_1		3.5	4.3	5.2	6	7
l_2		16	17	22	25	27
M		60	76	95	120	150
M_1		72	90	112	137	175
O		48.1	53.25	63.7	72.7	82.2
s		4x4.8	4x5.7	4x6.8	4x6.8	4x9.2
s_1		3xM4	3xM5	3xM6	3xM8	3xM8
t		4.3	4.45	5.5	6.9	8.3
t_1		5	7.2	8.7	14	13.7
Permitted shaft misalignm. and centre offset	**V**	0.05	0.05	0.05	0.05	0.1
	V_1	0.1	0.15	0.15	0.15	0.2
W		5	5	6	8	8
Z^{H8}		42	52	62	80	100
z		3.5	4.5	5	6	6

6) Turning for RS-ball bearing according to customer specifications – no turning is allowed for in the standard range.

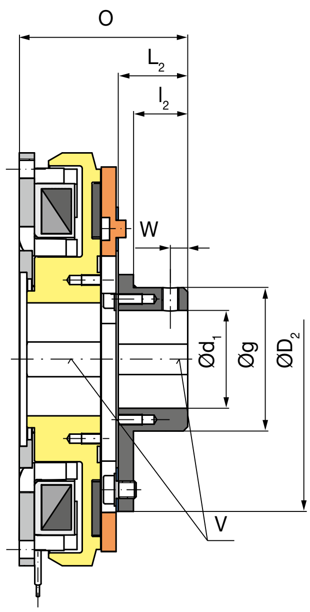
We reserve the right to make dimensional and constructional alterations.

ROBATIC®-electromagnetic clutch

Small mounting diameter **Sizes 3 – 7** **Type 500.21_.0**



Type 500.210.0
Small mounting diameter



Type 500.211.0
Small mounting diameter
with flange hub

Order number

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Size	Version		Coil voltage [VDC]	Rotor bore	Flange hub bore	Keyway acc.
Size 3 to 7	without accessories flange hub	**0** **1**	Coil voltage [VDC]: **24**, **104**	Rotor bore Ø d H7	Flange hub bore Ø d_1 H7	Keyway acc. DIN 6885/1 or DIN 6885/3

Example: 6 / 500.211.0 / 24 / 40 / 30 / DIN 6885/1

Small mounting diameter **Sizes 3 – 7** **Type 500.21_.0**

Technical data

Technical data				Size 3	Size 4	Size 5	Size 6	Size 7
Nominal torque [1]	Type 500.21_.0	M_2	[Nm]	10	20	45	80	160
Electrical power		P_{20}	[W]	18	26	37	53	79
Maximum speed		n_{max}	[rpm]	8600	7000	6100	5800	4500
Weight	without accessories	m	[kg]	0.65	1.1	2.1	3.4	6.4
	with flange hub	m	[kg]	0.7	1.16	2.25	3.6	6.95
Mass moment of inertia	Rotor [2]	I_{eig}	[10^{-4} kgm²]	2.2	5.3	13.47	32.31	90.13
	Armature disk	I_{eig}	[10^{-4} kgm²]	0.7	1.79	6.28	15.77	48.1
	Flange hub [2] + Armature disk	I_{eig}	[10^{-4} kgm²]	0.8	1.97	7.19	17.45	55.2

1) Please observe run-in conditions or minimum speed (see page 4).
2) With max. bore

Standard voltages 24 VDC; 104 VDC.
Permitted voltage tolerances acc. IEC 38 +/-10 %.

Bores

Bores			Size 3	Size 4	Size 5	Size 6	Size 7
Ød H7	Preferred bores	[mm]	10; 15	17; 20	20; 25; 30	25; 30; 35	30; 40; 50
	min.	[mm]	9	11	13	13	20
	max.	[mm]	20	28	35	42	55
Ød_1 H7	Preferred bores	[mm]	10; 15	17; 20	20; 25	25; 30	30; 40
	min.	[mm]	8	9	13	15	20
	max.	[mm]	17	20	30	35 [3]	45

3) Up to Ø 32 keyway acc. DIN 6885/1, over Ø 32 keyway acc. DIN 6885/3

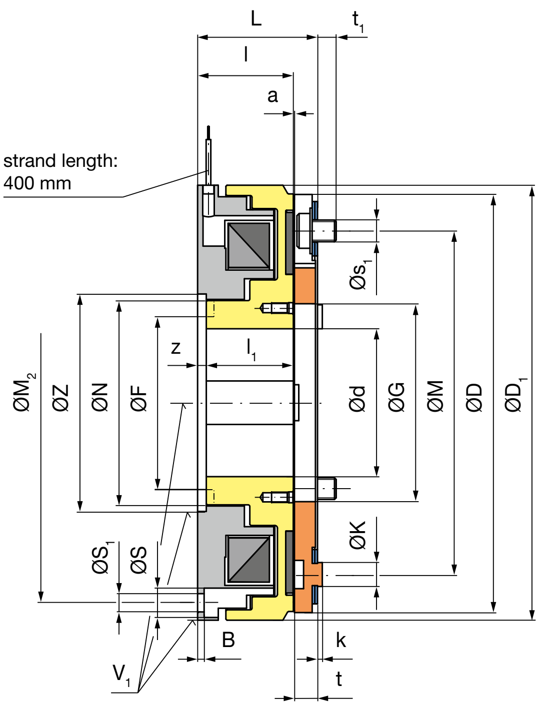
Dimensions [mm]	Size 3	Size 4	Size 5	Size 6	Size 7
a	0.2	0.2	0.2	0.3	0.3
b	4.5	4	5.5	5.5	7.5
D	73.5	92	115	140	177
D_1	80	100	125	150	190
D_2	54	70	88	110	140
F	26	36.5	41.5	47	63
G	36	49	57.5	74	95
g	27	29.5	44	47	66
H_{h9}	80	100	125	150	190
K	3 x 4.3	3 x 4.6	3 x 6.4	3 x 7	3 x 10.4
k	1.6	1.7	2.3	2.7	2.8
L	28.1	31.1	36.0	40.4	45.8
L_1	24	26.5	30	33.5	37.5
L_2	15	20	22	28	32
l	22	24	27	30	34

Dimensions [mm]		Size 3	Size 4	Size 5	Size 6	Size 7
l_1		3.5	4.3	5.2	6	7
l_2		11.5	16	17	22	25
M		46	60	76	95	120
M_1		72	90	112	137	175
O		43.1	51.1	58.1	68.8	77.9
s		4 x 4.5	4 x 5.7	4 x 6.8	4 x 6.8	4 x 9.2
s_1		3 x M3	3 x M4	3 x M5	3 x M6	3 x M8
t		3.9	4.4	5.8	6.6	8.0
t_1		4.1	5.2	6.7	8.7	8.0
Permitted shaft mis-alignm. and centre offset	V	0.05	0.05	0.05	0.05	0.1
	V_1	0.1	0.15	0.15	0.15	0.2
W		5	5	6	8	8
Z^{H8}		35	42	52	62	80
z		2	2.5	3	3.5	3.5

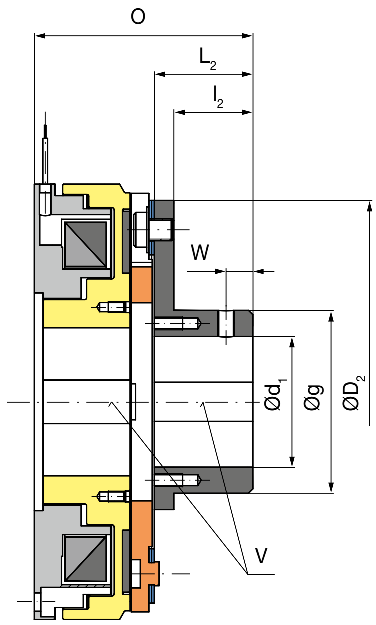
We reserve the right to make dimensional and constructional alterations.

ROBATIC®-electromagnetic clutch

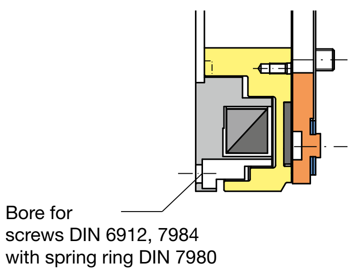
Small mounting diameter **Sizes 8 – 9** **Type 580.1_0**



Type 580.100
Coil carrier with small bolt circle



Type 580.110
Coil carrier with small bolt circle and flange hub



Order number

__ / 5 8 0 . 1 __ 0 / __ / __ / __ / __

Size			Coil voltage [VDC]	Hub bore	Flange hub bore	Keyway acc.
8	without accessories	**0**	**24**	Ø d H7	Ø d_1 H7	DIN 6885/1
9	flange hub	**1**	**104**			or DIN 6885/3

Example: 8 / 580.110 / 24 / 40 / 40

Technical data				Size 8	Size 9
Nominal torque [1]	Type 580.1_0	M_2	[Nm]	320	640
Electrical power		P_{20}	[W]	74	77
Maximum speed		n_{max}	[rpm]	3000	2200
Weight	without accessories	m	[kg]	10.1	20.5
	with flange hub	m	[kg]	13	23.5
Mass moment of inertia	Rotor [2]	I_{eig}	[10^{-4} kgm²]	165	450
	Armature disk	I_{eig}	[10^{-4} kgm²]	81	315
	Flange hub [2] + Armature disk	I_{eig}	[10^{-4} kgm²]	107	381

1) Please observe run-in conditions or minimum speed (see page 4).
2) With max. bore

Standard voltages 24 VDC; 104 VDC.
Permitted voltage tolerances acc. IEC 38 +/-10 %.

Bores			Size 8	Size 9
Ød H7	Preferred bores	[mm]	40; 50; 60	50; 60; 70
	min.	[mm]	24	34
	max.	[mm]	70	80
Ød_1 H7	Preferred bores	[mm]	40; 50	50; 60
	min.	[mm]	24	27
	max.	[mm]	60	80

Dimensions [mm]	Size 8	Size 9
a	0.5	0.5
B	3	3
D	193	251
D_1	200	251
D_2	185	242
F [3]	-	-
G	91	111
g	84	104
H_{h9}	230	290
i	8	9.5
K	3 x 11	4 x 20
k	2	4.2
L	55.1	63.9
L_2	45.3	53.9
l	44	51
l_1	40	47

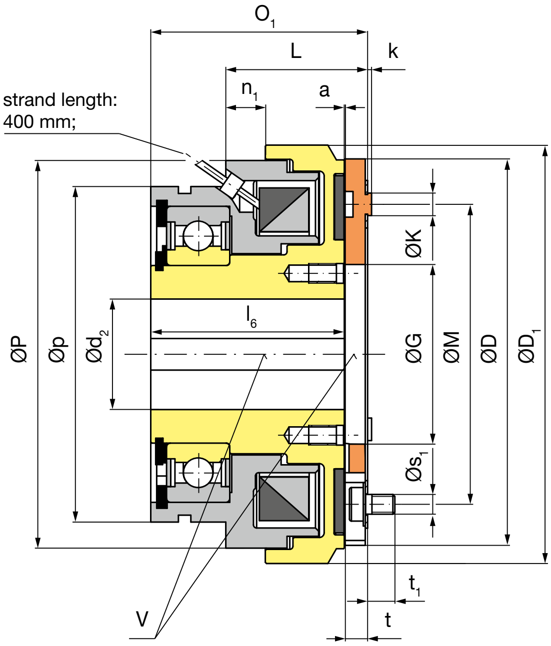
Dimensions [mm]		Size 8	Size 9
t		10.6	12.4
l_2		36.3	42.9
M		158	210
M_2		184	235
N		93.9	116.8
O		100.4	117.8
S		13.5	13.5
S_1		3 x 8.4	3 x 8.4
s_1		3 x M10	4 x M12
t_1		8.5	11.8
Permitted shaft misalignm. and centre offset	**V**	0.1	0.1
	V_1	0.2	0.25
W		15	20
Z H8		100	125
z		4	4

3) Turning for RS-ball bearing according to customer specifications – no turning is allowed for in the standard range.

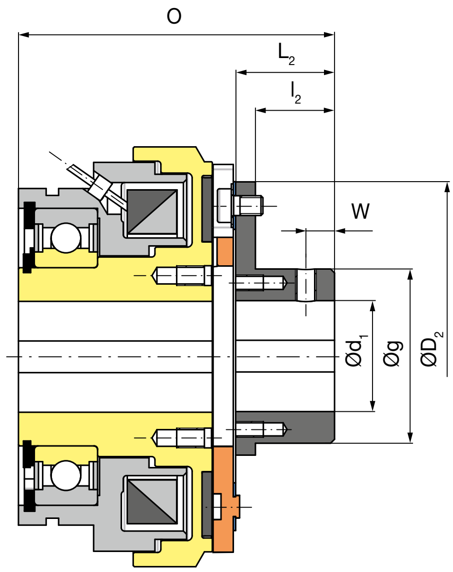
We reserve the right to make dimensional and constructional alterations.

ROBATIC®-electromagnetic clutch

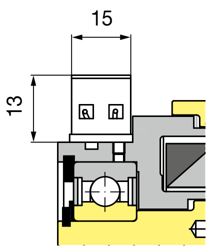
With bearing-supported coil carrier **Sizes 3 – 9** **Type 540.1_ _**

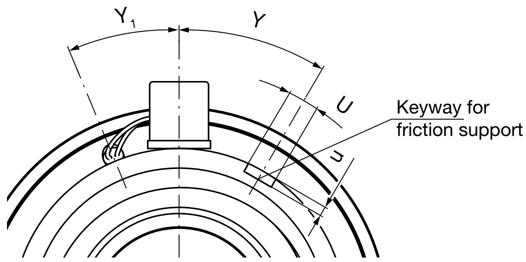


Type 540.100
With bearing-supported coil carrier



Type 540.110
With bearing-supported coil carrier and flange hub





Type 540.1_2 with connection terminal

Order number

without accessories **0**
flange hub **1**

__ / 5 4 0 . 1 __ __ / __ / __ / __ / __

Size			Coil voltage [VDC]	Rotor bore	Keyway acc.	Flange hub bore
Size 3 to 9	connection strand connection terminal	**0** **2**	Coil voltage [VDC] **24** **104**	Rotor bore $Ø\ d_2$	Keyway acc. DIN 6885/1 or DIN 6885/3	Flange hub bore $Ø\ d_1$

Example: 5 / 540.100 / 24 / 20

With bearing-supported coil carrier **Sizes 3 – 9** **Type 540.1_ _**

Technical data				Size 3	4	5	6	7	8	9
Nominal torque [1]	Type 540.1_ _	M_2	[Nm]	10	20	45	80	160	320	640
Electrical power		P_{20}	[W]	18	19	28	38	46	61	82
Maximum speed		n_{max}	[rpm]	8000	6000	5000	4200	3600	3000	2200
Weight	without accessories	m	[kg]	0.73	1.22	1.85	3.16	5.54	11.6	22.2
	with flange hub	m	[kg]	0.78	1.29	2.01	3.38	6.11	12.86	23.93
Mass moment of inertia	Rotor [2]	I_{eig}	[10^{-4} kgm²]	1.37	3.35	9.36	20.8	54.4	178	462
	Armature disk	I_{eig}	[10^{-4} kgm²]	0.35	1.05	2.97	7.04	14	81	315
	Flange hub [2] + Armature disk	I_{eig}	[10^{-4} kgm²]	0.5	1.5	4.5	10.9	37.1	107	381

1) Please observe run-in conditions or minimum speed (see page 4).
2) With max. bore

Standard voltages 24 VDC; 104 VDC.
Permitted voltage tolerances acc. IEC 38 +/-10 %.

Bores			Size 3	4	5	6	7	8	9
Ød₂ H7	Preferred bores	[mm]	10; 15	17; 20	20; 25; 30	20; 25; 30	25; 30; 40	40; 45; 50	40; 50; 60
	min.	[mm]	7	8	12	12	19	22	30
	max.	[mm]	20 [3]	25 [3]	30	40	50	60	65
Ød₁ H7	Preferred bores	[mm]	10; 15	17; 20	20; 25	25; 30	30; 40	40; 50	50; 60
	min.	[mm]	8	9	13	15	20	24	27
	max.	[mm]	17	20	30	35 [4]	45	60	80

3) With max. bore keyway to DIN 6885/3
4) Up to Ø 32 keyway acc. DIN 6885/1, over Ø 32 keyway acc. DIN 6885/3

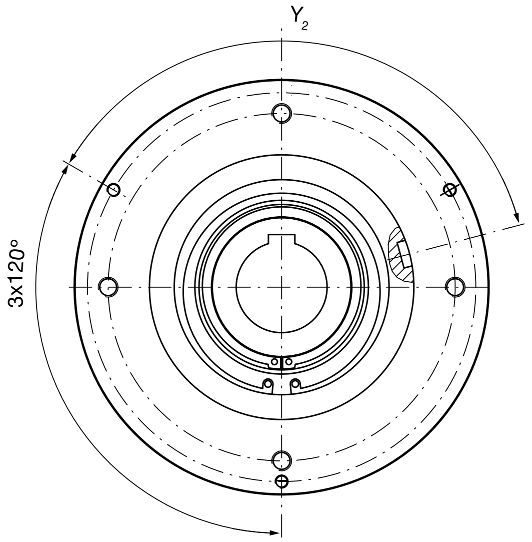
Dimensions [mm]	Size 3	4	5	6	7	8	9
a	0.2	0.2	0.2	0.3	0.3	0.5	0.5
D	64.5	81.5	99	118	151	193	251
D₁	70	87	106	125	157	200	251
D₂	55	70	88	110	140	185	242
G	29.5	30.5	45.5	48	69	91	111
g	27	29.5	44	47	66	84	104
K	3x4.3	3x4.6	3x5.8	3x7	3x9.4	3x11.5	4x20
k	1.6	1.7	2.3	2.7	2.8	2.0	4.2
L	28	31	35.9	40.5	46.5	55.4	63.9
L₂	15	20	25	29.5	38	45.3	53.9
l₂	11.5	16	20	23.5	31	36.3	42.9
l₆	40	43.5	49	55	61.5	74	81
M	46	60	76	95	120	158	210
n₁	9	9	10	10.5	12	13	15.5

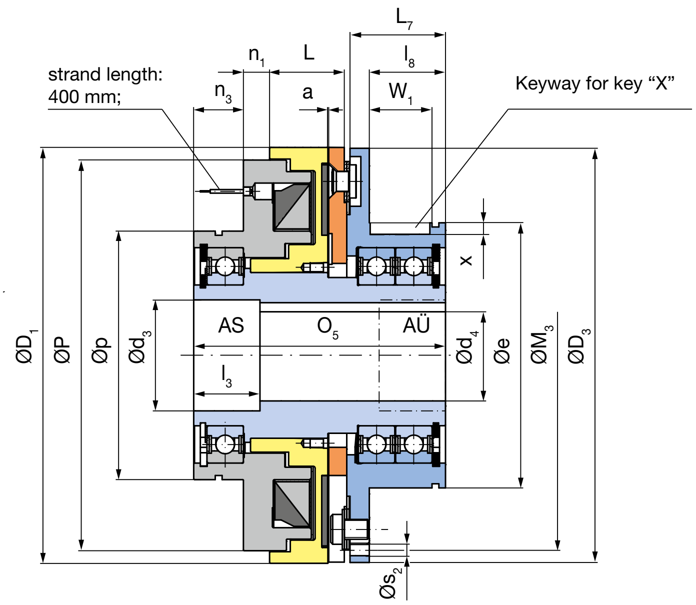
Dimensions [mm]		Size 3	4	5	6	7	8	9
O		59	68	79.9	91.5	108.5	130.4	147.8
O₁		44	48	54.9	62.0	70.5	85.1	93.9
P		70	79.7	98.2	115.4	150.4	189.4	235.8
p		64	72	85	105	120	145	150
s₁		3xM3	3xM4	3xM5	3xM6	3xM8	3xM10	3xM12
t		3.8	4.3	5.7	6.7	8.7	10.6	12.4
t₁		4.1	5.0	6.9	6.7	8.2	8.5	11.8
U		6	8	8	10	12	14	14
u		2	2.5	2.5	2.5	3	4.5	6
Permitted shaft mis-alignment V		0.05	0.05	0.05	0.05	0.1	0.1	0.1
W		5	5	6	10	10	15	20
Y	[°]	45	45	30	30	30	30	30
Y₁	[°]	30	30	22.5	22.5	15	15	15

We reserve the right to make dimensional and constructional alterations.

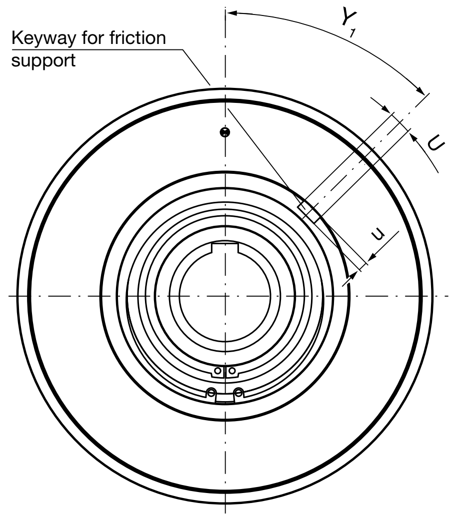
ROBATIC®-electromagnetic clutch

With bearing-supported flange [1] Sizes 3 – 9 **Type 540.14_**





Type 540.140
With bearing-supported flange



Order number

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▲						▲	▲	▲	▲	▲
Size 3 to 9	connection strand connection terminal					**0** **2**	Coil voltage [VDC] **24** **104**	Hub bore $Ø\ d_4$	Keyway acc. DIN 6885/1 or DIN 6885/3	Counterbore: AS coil carrier side AÜ transmission flange side

Example: 5 / 540.140 / 24 / 24 / 6885/1 / AS

With bearing-supported flange [1] Sizes 3 – 9 **Type 540.14_**

Technical data				Size						
				3	4	5	6	7 *)	8 *)	9 *)
Nominal torque [2]	Type 540.14_	M_2	[Nm]	10	20	45	80	160	320	640
Electrical power		P_{20}	[W]	18	19	28	38	46	61	82
Maximum speed		n_{max}	[rpm]	8000	6000	5000	4200	3600	3000	2200
Weight	with max. bore	m	[kg]	1.2	1.85	2.95	4.7	8.25	16.6	29.2
Mass moment of inertia	Rotor (max. bore)	I_{eig}	[10^{-4} kgm²]	1.59	3.82	10.24	23.22	52.05	197.66	497
	Armature disk + driver flange	I_{eig}	[10^{-4} kgm²]	1.97	4.06	9.95	22.93	50.53	147.83	533.7

1) 2-shaft connection on request
2) Please observe run-in conditions or minimum speed (see page 4).
*) From Size 7 on, the installation of a key in the driver flange is necessary in order to ensure torque transmission.

Standard voltages 24 VDC; 104 VDC.
Permitted voltage tolerances acc. IEC 38 +/-10 %.

Bores			Size						
			3	4	5	6	7	8	9
Ød_4	maximum	[mm]	15	19 [3]	24	33	46	58	65
Ød_3		[mm]	16	20	26	26 [4] 37 [5]	37 [6] 47 [7]/ _ [8]	37 [6] 47 [7] 59 [8]	47 [9] 67 [8] _ [10]

3) Above Ø 18 keyway to DIN 6885/3 with $d_{4\,max}$ – depth of hub keyway $1.2^{+0.1}$
4) above Ø d_4 to 19
5) above Ø d_4 over 19
6) above Ø d_4 to 28
7) above Ø d_4 over 28
8) above Ø d_4 over 38
9) above Ø d_4 to 38
10) above Ø d_4 über 55

Dimensions [mm]	Size						
	3	4	5	6	7	8	9
a	0.2	0.2	0.2	0.3	0.3	0.5	0.5
D_1	70	87	106	125	157	200	251
D_3	71	82	102	122	156	199	250
G	29.5	30.5	45.5	48	69	91	111
e_{h6}	56	64	75	90	110	135	160
L	28	31	35.9	40.5	46.5	55.4	63.9
L_7	25.8	29.7	38.7	43.5	48.9	53.9	57.1
l_3	35	45 [11] 35 [12]	50 [4] 40 [5]	60 [4] 40 [5] 20 [7]	55 [6] 35 [7] _ [8]	75 [6] 55 [7] 25 [8]	70 [9] 40 [8] _ [10]
l_8	21.5	24	30	34	39	44	46
M_3	66	75	94	112	145	184	235
n_1	9	9	10	10.5	12	13	15.5
n_3	16	17	19	21.5	24	30	30

Dimensions [mm]		Size						
		3	4	5	6	7	8	9
O_5		70	78	94	106	120	140	152
P		70	79.7	98.2	115.4	150.4	189.4	235.8
p		64	72	85	105	120	145	150
s_2		3 x M4	3 x M5	3 x M5	3 x M6	3 x M6	3 x M8	3 x M8
U		6	8	8	10	12	14	14
u		2	2.5	2.5	2.5	3	4.5	6
W_1		17.5	19	24.5	28	31	36	38
Key X [13]		6x6 x16	6x6 x18	8x7 x22	10x8 x25	10x8 x28	14x9 x32	16x10 x36
x		3.5	3.5	4	5	5	5.5	6
Y_1	[°]	75	75	52.5	52.5	45	45	45
Y_2	[°]	90	90	90	90	90	90	135

11) above Ø d_4 bis 14
12) above Ø d_4 über 14
13) From Size 7 on, the installation of a key in the driver flange is necessary in order to ensure torque transmission.

We reserve the right to make dimensional and constructional alterations.

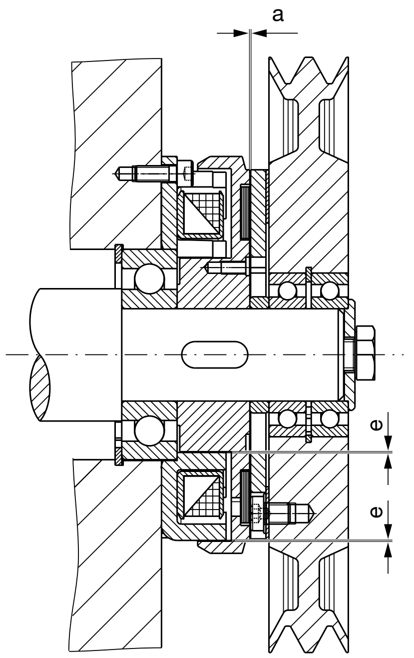


Fig. 1

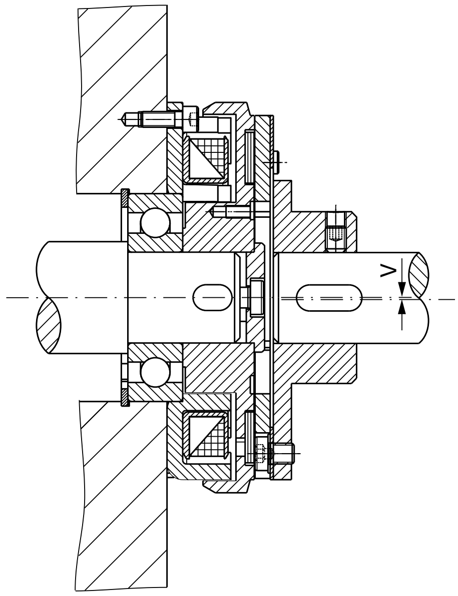


Fig. 2

	Size						
	3	4	5	6	7	8	9
a	$0.2^{+0.1}_{-0.05}$	$0.2^{+0.15}_{-0.05}$	$0.2^{+0.15}_{-0.05}$	$0.3^{+0.15}_{-0.05}$	$0.3^{+0.15}_{-0.05}$	$0.5^{+0.15}_{-0.1}$	$0.5^{+0.15}_{-0.1}$
e	0.25	0.3	0.2	0.35	0.5	0.55	0.6

Table 1 Adjustment of the air gaps

	Size						
	3	4	5	6	7	8	9
V	0.05	0.05	0.05	0.05	0.1	0.1	0.1

Table 2 Permitted shaft misalignments

The dimension “a” (Fig. 1) must be adjusted according to Table 1. Please ensure that the shaft is fastened axially, since otherwise the dimension “a” will change and cause the armature disk to band against coil carrier.
The air gap “e” is selected so that a brushing of the rotor against the coil carrier is not possible when keeping to the permitted centre offsets V and V1 (see Table “Dimensions”).

Design:

ROBATIC®-electromagnetic clutches are manufactured according to the electric protection IP 54 specification and the class of insulation F up to 155 °C for coil, casting compound, connection strands and the magnetic coil plastic-coated. The friction linings are asbestos-free, the surfaces of coil carrier, rotor and flange hub are phosphated. The armature disk is gas nitro-carburized and the transmission spring is made of stainless steel. The drive elements should be made from a material which is a poor magnetic conductor in order to prevent magnetic loss due to leakage flux and therefore loss of force.

ROBATIC®-electromagnetic clutches are used for dry running. The torque is transmitted via the connection of the armature disk on the iron poles and the friction lining of the rotor (except the double-flow ROBATIC® clutch without friction lining, Type 500.30_.0).

When coupling two shafts, the eccentricity “V” of the shafts according to Table 2 must not be exceeded. The larger the displacement “V” the more the torque decreases and the hotter the friction surface becomes. In the case of this arrangement care must be taken that both shafts have no axial backlash since, otherwise, a brushing of the rotor would also be possible. The flange hub is kept axially by means of a set screw (on set 90° to the key). The “V”-values are indicated again in the Technical Data of the individual clutches.

Please observe in particular the following:

The run-in conditions or the minimum speed must be observed (see page 4).

The friction surfaces have to be absolutely free of oil and grease as otherwise, the torque drops significantly. The air gap “a” (Fig. 1) has to be checked periodically. The clutch does not function correctly, if the max. working air gap is exceeded (see Table 4, page 25).

Installation and maintenance must be carried out by trained and qualified specialists.

Clutch size calculation

Formulas

1. Drive torque

$$M_A = \frac{9550 \times P_A}{n} \quad [Nm]$$

2. Required torque

$$M_{erf.} \geq K \times M_A \quad [Nm]$$

3. Switchable torque of the clutch (acc. to diagram 1, page 24)

$$M_S \geq M_{erf.} \quad [Nm]$$

4. Mass moment of inertia

$$I = I_{eig.} + I_{zus.} \quad [kgm^2]$$

5. Acceleration torque of the clutch

$$M_a = M_S \pm M_L \quad [Nm]$$

6. Acceleration time

$$t_a = \frac{I \times n}{9.55 \times M_a} + t_1 \quad [sec]$$

7. Max. switching frequency per hour (dependent on time)

$$S_{h\,max} = \frac{1}{t_{vM} + (t_a + t_2) \times 1.2} \times 3600 \quad [h^{-1}]$$

8. Friction work per acceleration

$$Q_a = \frac{I \times n^2}{182.4} \times \frac{M_s}{M_a} \quad [J]$$

9. Examination of the selected clutch size in diagram 2 (page 24 friction power diagram).
Intersection friction work / switching frequency must be below the friction power curve! If it is above, the next size has to be selected and re-calculated from point 3 on.

$$Q_a < Q_E \quad [J]$$

10. Number of switchings until re-adjustment

$$Z_n = \frac{Q_1}{Q_a} \times (a_n - a) \quad [-]$$

11. Number of switchings until wear limit

$$Z = \frac{Q_{ges.}}{Q_a} \quad [-]$$

Key:

P_A	[kW]	input power	
M_A	[Nm]	drive torque	
M_a	[Nm]	acceleration torque of the clutch	
$M_{erf.}$	[Nm]	required torque	
M_L	[Nm]	load torque (+ = lower load) (- = lift load)	
M_S	[Nm]	switchable torque of the clutch (diagram 1, page 24)	
n	[rpm]	input speed	
K		safety factor ≥ 2	
I	[kgm²]	mass moment of inertia	
$I_{eig.}$	[kgm²]	own mass moment of inertia (“Technical data“)	
$I_{zus.}$	[kgm²]	additional mass moment of inertia	
t_a	[sec]	acceleration time	
t_{vM}	[sec]	braking time of the machine	
t_1	[sec]	switch-on time of the clutch	Table 3, page 25
t_2	[sec]	switch-off time of the clutch	Table 3, page 25
$S_{h\,max}$	[h⁻¹]	max. switching frequency per hour (dependent on time)	
$Q_{ges.}$	[J]	total friction work (acc. Table 4, page 25)	
Q_a	[J]	friction work per acceleration	
Q_E	[J]	perm. friction work for single switching	Table 4, page 25
Q_1	[J/mm]	friction work until 1 mm wear	Table 4, page 25
Z_n		number of switchings until re-adjustment	
Z		number of switchings until wear limit	
a	[mm]	nominal air gap	Table 4, page 25
a_n	[mm]	max. working air gap	Table 4, page 25

Calculation example

Data:

Input power	P_A	= 3 kW
Input speed	n	= 1400 rpm
Load torque output	M_L	= 15 Nm
Additional mass moment of inertia	$I_{add.}$	= 0.15 kgm²
Braking time of the machine	t_{vM}	= 1.5 [sec]
180 switchings per hour		

Drive torque

$$M_A = \frac{9550 \times P_A}{n} = \frac{9550 \times 3}{1400} = \mathbf{20.5}\ [Nm]$$

Required torque

$$M_{erf.} = K \times M_A = 2 \times 20.5 = \mathbf{41}\ [Nm]$$

Determined clutch size (acc. to diagram 1) = Size 6

$$M_S \geq M_{erf.} = \mathbf{47}\ [Nm]$$

Selected clutch = Size 6, Type 500.200.0

Mass moment of inertia

$$I = I_{eig.} + I_{zus.} = 0.001756 + 0.15 = \mathbf{0.151756}\ [kgm^2]$$

Acceleration torque of the clutch

$$M_a = M_S - M_L = 47 - 15 = \mathbf{32}\ [Nm]$$

Acceleration time of the clutch

$$t_a = \frac{I \times n}{9.55 \times M_a} + t_1{}^* = \frac{0.151756 \times 1400}{9.55 \times 32} + 0.15 = \mathbf{0.845}\ [sec]$$

* Switching times t_1 und t_2 from Table 3, page 25 = without overexcitation

Max. switching frequency per hour

$$S_{h\,max} = \frac{1}{t_{vM} + (t_a + t_2{}^*) \times 1.2} \times 3600$$

$$S_{h\,max} = \frac{1}{1.5 + (0.845 + 0.060) \times 1.2} \times 3600 = \mathbf{1392}\ [h^{-1}]$$

Friction work per acceleration

$$Q_a = \frac{I \times n^2}{182.4} \times \frac{M_S}{M_a}$$

$$Q_a = \frac{0.151756 \times 1400^2}{182.4} \times \frac{47}{32} = \mathbf{2395}\ [J] \leq Q_E$$

The point of intersection determined in diagram 2 must be located in or under the characteristic curve of the selected clutch.

Switching frequency: 180 switchings per hour = permitted

Number of switchings until re-adjustment

$$Z_n = \frac{Q_1}{Q_a} \times (a_n - a)$$

$$Z_n = \frac{57 \times 10^7}{2395} \times (1.2 - 0.3) = \mathbf{214196}\ \text{switchings}$$

Number of switchings until wear limit

$$Z = \frac{Q_{ges.}}{Q_a} = \frac{100 \times 10^7}{2395} = \mathbf{417536}\ \text{switchings}$$

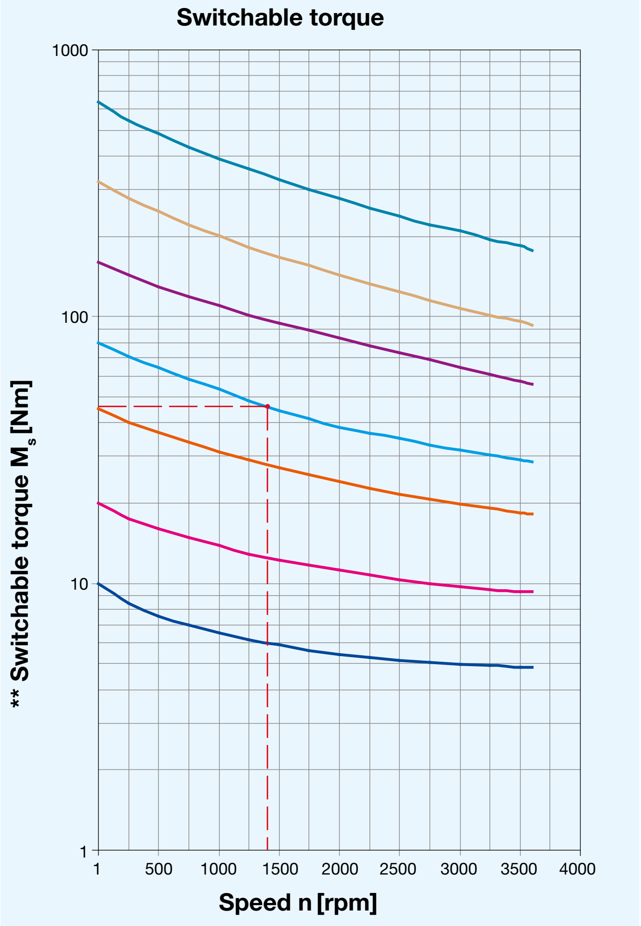


Diagram 1 (not valid for Type 500.30_)

** Friction surfaces have been run in

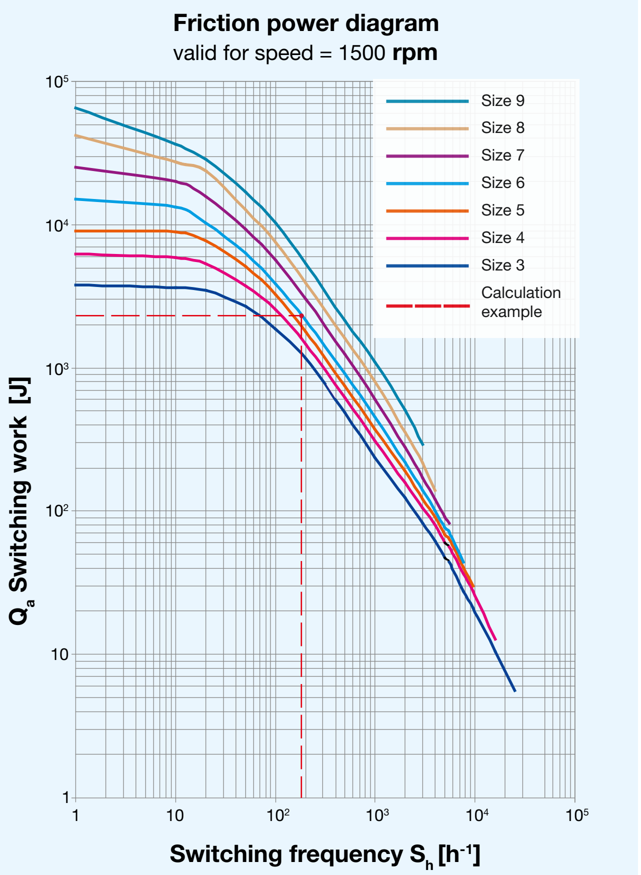


Diagram 2 (not valid for Type 500.30_)

Switching times

The switching times stated in Table 3 have been determined by comprehensive series of tests. They are valid for switching DC-side with nominal air gap and warm coil. Deviations depend on the respective installation situation, ambient temperatures, release path and the type of rectification with which the corresponding clutch is operated.

Switching times				Size 3	4	5	6	7	8	9
without overexcitation	Type 500._ _ _._	t_{11}	[sec]	0.010	0.015	0.020	0.030	0.045	0.050	0.060
		t_1	[sec]	0.045	0.065	0.080	0.150	0.200	0.350	0.400
		t_2	[sec]	0.012	0.020	0.045	0.060	0.090	0.095	0.130
with overexcitation	Type 500._ _ _._	t_{11}	[sec]	0.003	0.005	0.007	0.010	0.015	0.020	0.035
		t_1	[sec]	0.025	0.035	0.040	0.075	0.100	0.170	0.235
without overexcitation	Type 540._ _ _._	t_{11}	[sec]	0.010	0.012	0.012	0.020	0.025	0.050	0.060
		t_1	[sec]	0.050	0.072	0.112	0.160	0.200	0.350	0.460
		t_2	[sec]	0.014	0.020	0.030	0.050	0.075	0.095	0.130
with overexcitation	Type 540._ _ _._	t_{11}	[sec]	0.004	0.005	0.006	0.010	0.013	0.020	0.035
		t_1	[sec]	0.024	0.035	0.056	0.080	0.100	0.170	0.235
without overexcitation	Type 500.3_ _._	t_{11}	[sec]	0.017	0.026	0.035	0.052	0.079	-	-
		t_1	[sec]	0.079	0.113	0.140	0.262	0.350	-	-
		t_2	[sec]	0.010	0.016	0.036	0.048	0.072	-	-
with overexcitation	Type 500.3_ _._	t_{11}	[sec]	0.005	0.009	0.012	0.017	0.026	-	-
		t_1	[sec]	0.044	0.061	0.070	0.131	0.175	-	-

Table 3

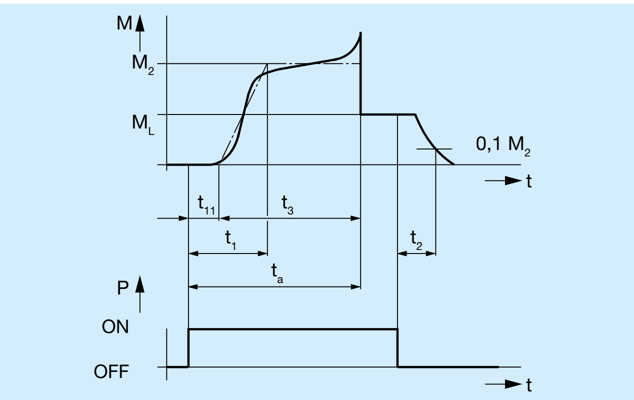


Diagram 3: Torque-Time Diagram

Key:

M_2 = Nominal torque of the clutch
M_L = Load torque of the drive
P = Electrical power
t_a = Acceleration time
t_1 = Connection time
t_{11} = Response delay on connection
t_2 = Separation time
t_3 = Slip time

Friction work [1] and air gap				Size 3	4	5	6	7	8	9
Friction work up to 1 mm wear	Type 500._ _ _._	Q_1	[10^7 J/mm]	12.5	20	33	57	100	105	170
	Type 540._ _ _._	Q_1	[10^7 J/mm]	8.8	13.4	24	36	60	105	170
Total friction work	Type 500._ _ _._	Q_{ges}	[10^7 J]	12.5	25	50	100	200	185	340
	Type 540._ _ _._	Q_{ges}	[10^7 J]	8	16	35	68	135	185	340
Permitted friction work with a single switching		Q_E	[10^3 J]	3.8	6.2	9	15	25	42	65
Nominal air gap		a	[mm]	0.2	0.2	0.2	0.3	0.3	0.5	0.5
Max. working air gap		a_n	[mm]	0.6	0.8	1.0	1.2	1.5	1.8	2.0

Table 4

1) The friction work data are not valid for Type 500.30_.0 double-flow design.

Please Observe!

Due to operating parameters such as sliding speed, pressing or temperature the **wear values** can **only be considered guideline values**.

Half-wave and bridge rectifiers Type 02_.000.6

c UL us E189728 CE

Application

Rectifiers are used to connect DC consumers to alternating voltage supplies, for example electromagnetic brakes and clutches (ROBA-stop®, ROBA-quick®, ROBATIC®), electromagnets, electrovalves, contactors, switch-on safe DC motors, etc.

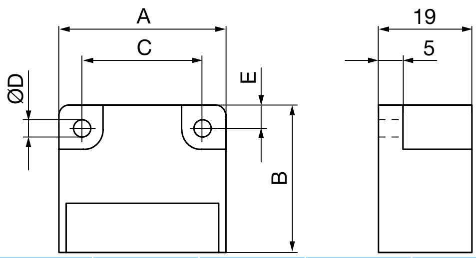
Function

The AC input voltage (VAC) is rectified (VDC) in order to operate DC voltage units. Also, voltage peaks, which occur when switching off inductive loads and which may cause damage to insulation and contacts, are limited and the contact load reduced.

Electrical connection (Terminals)

1 + 2 Input voltage
3 + 4 Connection for an external switch for DC-side switching
5 + 6 Coil
7 – 10 Free nc terminals (only for Size 2)

Dimensions (mm)



Size	A	B	C	ØD	E
1	34	30	25	3.5	4.5
2	54	30	44	4.5	5.0
3/4	64	30	54	4.5	5.0

Accessories: Mounting bracket set for 35 mm rail acc. EN 60715: Article No. 1803201.

Order number

__ / 0 2 __ . 0 0 0 . 6

Size	Type
1 to 4	4 Half-wave rectifier 5 Bridge rectifier

Technical data

				Bridge rectifier		Half-wave rectifier			
Calculation output voltage				VDC = VAC x 0.9		VDC = VAC x 0.45			
Type				1/025	2/025	1/024	2/024	3/024	4/024
Max. input voltage	± 10%	U_{AC}	[VAC]	230	230	400	400	500	600
Max. output voltage		U_{DC}	[VDC]	207	207	180	180	225	270
Output current	≤ 50°C	I_{RMS}	[A]	2.5	2.5	3.0	4.0	4.0	4.0
	at max. 85 °C	I_{RMS}	[A]	1.7	1.7	1.8	2.4	2.4	2.4
Max. coil nominal capacity at U_{AC} = 115 VAC	≤ 50 °C	P_{nenn}	[W]	260	260	-	-	-	-
	up to 85 °C	P_{nenn}	[W]	177	177	-	-	-	-
U_{AC} = 230 VAC	≤ 50 °C	P_{nenn}	[W]	517	517	312	416	416	416
	up to 85 °C	P_{nenn}	[W]	352	352	187	250	250	250
U_{AC} = 400 VAC	≤ 50 °C	P_{nenn}	[W]	-	-	540	720	720	720
	up to 85 °C	P_{nenn}	[W]	-	-	324	432	432	432
U_{AC} = 500 VAC	≤ 50 °C	P_{nenn}	[W]	-	-	-	-	900	900
	up to 85 °C	P_{nenn}	[W]	-	-	-	-	540	540
U_{AC} = 600 VAC	≤ 50 °C	P_{nenn}	[W]	-	-	-	-	-	1080
	up to 85 °C	P_{nenn}	[W]	-	-	-	-	-	648
Peak reverse voltage			[V]	1600	1600	2000	1600	2000	2000
Rated insulation voltage		U_{RMS}	[V_{RMS}]	320	320	500	500	630	630
Pollution degree (insulation coordination)				1	1	1	1	1	1
Device fuses				To be included in the input voltage line.					
Recommended microfuse switching capacity H The microfuse corresponds to the max. possible connection capacity. If fuses are used corresponding to the actual capacities, the permitted limit integral I²t must be observed on selection.				FF 3.15 A	FF 3.15 A	FF 4 A	FF 5 A	FF 5 A	FF 5 A
Permitted limit integral		I^2t	[A^2s]	40	40	50	100	50	50
Protection				IP65 components, encapsulated / IP20 terminals					
Terminals				Cross-section 0.14 - 1.5 mm² (AWG 26-14)					
Ambient temperature			[°C]	-25 to +85					
Storage temperature			[°C]	-40 to +85					
Conformity markings				UL, CE	UL, CE	UL, CE	UL, CE	UL, CE	CE
Installation conditions				The installation position can be user-defined. Please ensure sufficient heat dissipation and air convection! Do not install near to sources of intense heat!					

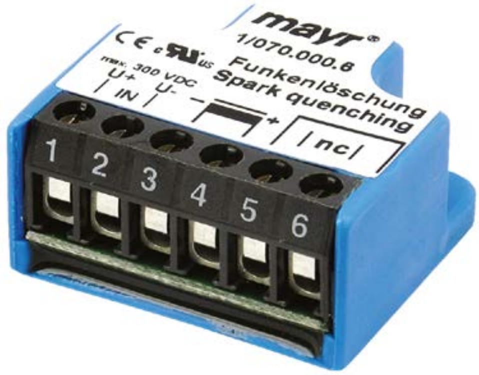
Spark quenching unit Type 070.000.6

c UL us E189728 CE

Application

Reduces spark production on the switching contacts occurring during DC-side switch-off of inductive loads.

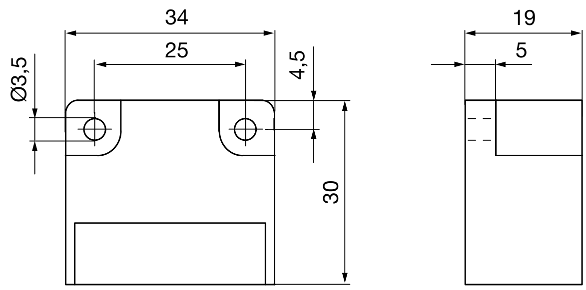
- Voltage limitation according to VDE 0580 2000-07, Item 4.6.
- Reduction of EMC-disturbance by voltage rise limitation, suppression of switching sparks.
- Reduction of brake engagement times by a factor of 2-4 compared to free-wheeling diodes.



Function

The spark quenching unit will absorb voltage peaks resulting from inductive load switching, which can cause damage to insulation and contacts. It limits these to 70 V and reduces the contact load. Switching products with a contact opening distance of > 3 mm are suitable for this purpose.

Dimensions (mm)



Electrical connection (Terminals)

1 (+)	Input voltage
2 (–)	Input voltage
3 (–)	Coil
4 (+)	Coil
5	Free nc terminal
6	Free nc terminal

Technical data

Input voltage	max. 300 VDC, max. 615 V_{peak} (rectified voltage 400 VAC, 50 / 60 Hz)
Switch-off energy	max. 9 J / 2 ms
Power dissipation	max. 0.1 Watt
Rated voltage nc terminals	250 V
Protection	IP65 / IP20 terminals
Ambient temperature	-25 °C up to +85 °C
Storage temperature	-25 °C up to +105 °C
Max. conductor cross-section	2.5 mm² / AWG 26-12
Max. terminal tightening torque	0.5 Nm

Accessories

Mounting bracket set for 35 mm mounting rail acc. EN 60715:
Article No. 1803201

Order number

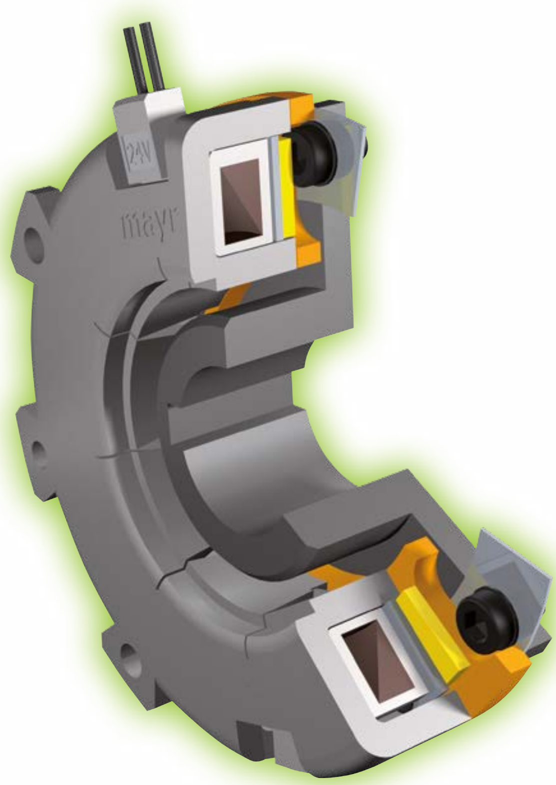
__ / 0 7 0 . 0 0 0 . 6

▲

Size
1

ROBA®-quick electromagnetic brake

Exact positioning over the entire service lifetime



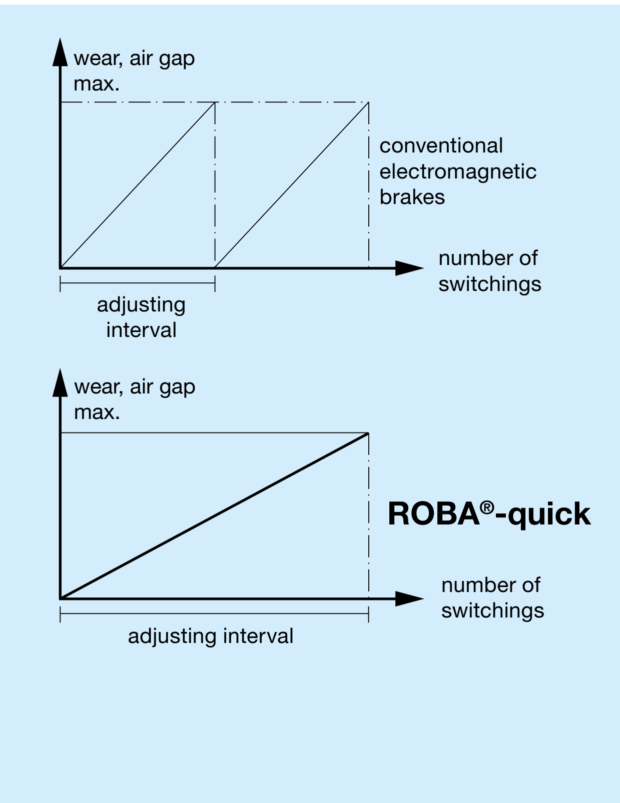
- **High torque security**
  due to an optimised magnetic circuit and new design of the ROBA®-quick. Therefore higher capacities due to less magnetic leakage flux.

- **Exact positioning until wear limit**
  ideal for positioning operations

- **Large internal diameters of the magnetic coil bodies**
  Therefore large permitted shaft diameters and few magnetic field losses

- **Low-noise**

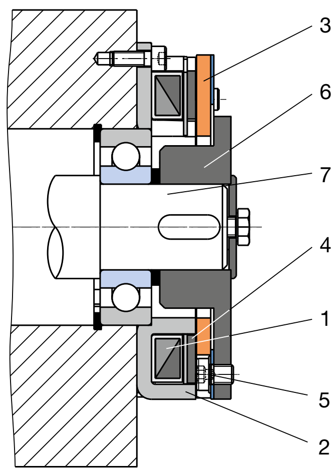
- **Short switching times/high switching frequencies**



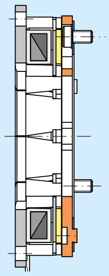
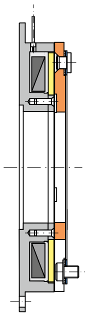
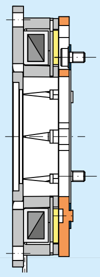
Functional principle

ROBA®-quick are 'energise to engage', electromagnetic pole face brakes.
When DC voltage is applied to the magnetic coil (1), a magnetic field is built up. The armature disk (3) is attracted to the brake coil carrier with friction lining (4). The braking torque runs from the coil carrier (2) via friction lining (4), armature disk (3) and membrane transmission spring (5) to the flange (6) and the shaft.

If the magnetic coil is de-energised, the membrane transmission spring (5) draws the armature disk (3) back to the flange (6). The brake is released and the shaft (7) can run freely.

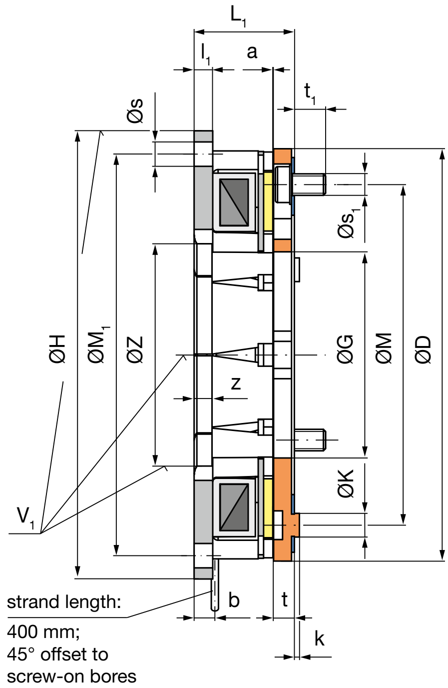


Summary of constructional designs ROBA®-quick

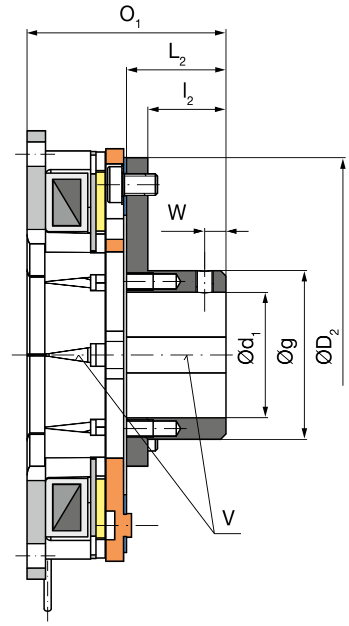
ROBA®-quick standard 	Sizes 3 to 7 Type 520.20_.0	without accessories with flange hub with internal hub	Type Type Type	520.200.0 520.201.0 520.202.0 **Pages 30 – 31**
ROBA®-quick standard 	Sizes 8 to 9 Type 520.1_0	without accessories with flange hub with internal hub	Type Type Type	520.100 520.110 520.120 **Pages 32 – 33**
ROBA®-quick small mounting diameter 	Sizes 3 to 7 Type 520.21_.0	without accessories with flange hub with internal hub	Type Type Type	520.210.0 520.211.0 520.212.0 **Pages 34 – 35**

ROBA®-quick electromagnetic brake

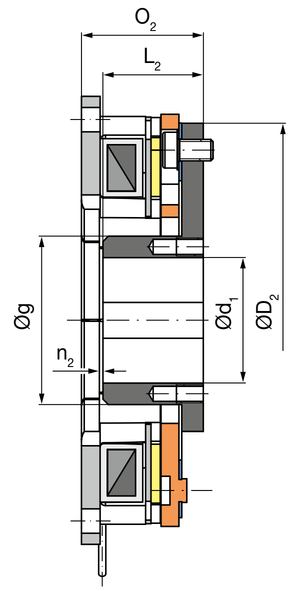
Standard **Sizes 3 – 7** **Type 520.20_.0**



Type 520.200.0
Standard



Type 520.201.0
Standard with flange hub



Type 520.202.0
Standard with internal hub

Order number

__ / 5 2 0 . 2 0 __ . 0 / __ / __ / __

Size **3** **to** **7**	without accessories **0** flange hub **1** internal hub **2**	Coil voltage [VDC]	**24** **104**	Hub * bore Ø d_1 H7	Keyway *acc. DIN 6885/1 or DIN 6885/3

Example: 5 / 520.202.0 / 24 / 30 / DIN 6885/1

* Stated only with flange hub design or internal hub design

Standard **Sizes 3 – 7** **Type 520.20_.0**

Technical data				Size 3	Size 4	Size 5	Size 6	Size 7
Nominal torque [1]	Type 520.20_.0	M_2	[Nm]	8.5	17	45	80	160
Electrical power		P_{20}	[W]	13	20	31	47	71
Maximum speed		n_{max}	[rpm]	8600	7000	6100	5800	4500
Weight	without accessories	m	[kg]	0.38	0.55	1.25	1.88	3.5
	with flange hub	m	[kg]	0.42	0.86	1.40	2.35	7.5
Mass moment of inertia	Armature disk	I_{eig}	[10^{-4} kgm²]	0.76	1.92	6.86	17.56	52.86
	Flange hub [2] + Armature disk	I_{eig}	[10^{-4} kgm²]	1.02	2.75	8.63	24.66	70.63

1) Please observe run-in conditions or minimum speed (see page 4).
2) With max. bore

Standard voltages 24 VDC; 104 VDC.
Permitted voltage tolerances acc. IEC 38 +/-10 %.

Bores			Size 3	Size 4	Size 5	Size 6	Size 7
$Ød_1$ H7	Preferred bores	[mm]	17; 20	20; 25	25; 30	30; 40	40; 50
	min.	[mm]	9	13	15	20	23
	max.	[mm]	20	30	35 [3]	45	60

3) Up to Ø 32 keyway acc. DIN 6885/1, over Ø 32 keyway acc. DIN 6885/3

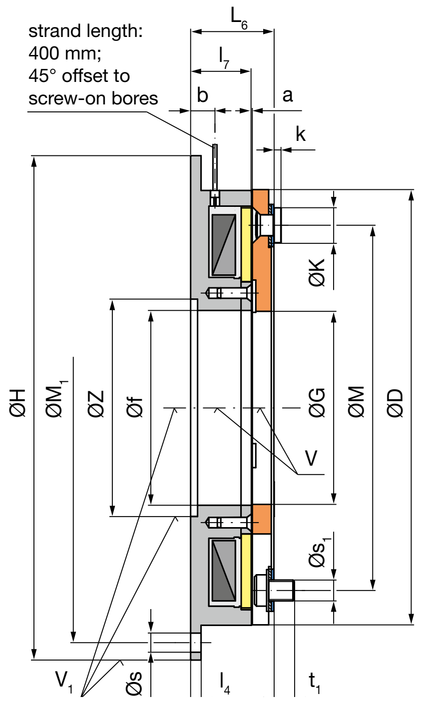
Dimensions [mm]	Size 3	Size 4	Size 5	Size 6	Size 7
a	0.2	0.2	0.2	0.3	0.3
b	4.5	4	5.5	5.5	7.5
D	73.5	92	115	140	177
D_2	70	88	110	140	170
G	36	49	57.5	74	95
g	29.5	44	47	66	84
H_{h9}	80	100	125	150	190
K	3 x 4.5	3 x 5.5	3 x 6.6	3 x 8.7	3 x 8.8
k	1.7	2.3	2.7	2.8	2.7
L_1	22.1	24.7	28.1	31.4	34.7
L_2	20	22	28	32	36
l_1	3.5	4.3	5.2	6	7
l_2	16	17	22	25	27
M	60	76	95	120	150

Dimensions [mm]		Size 3	Size 4	Size 5	Size 6	Size 7
M_1		72	90	112	137	175
n_2		2.6	3.2	1.1	0.3	1.7
O_1		42.1	46.7	56.1	63.4	70.7
O_2		26.1	29.7	34.1	38.3	43.7
s		4 x 4.8	4 x 5.7	4 x 6.8	4 x 6.8	4 x 9.2
s_1		3 x M4	3 x M5	3 x M6	3 x M8	3 x M8
t		3.9	4.5	5.8	7.1	8.3
t_1		5.2	7.2	8.7	8.0	9.7
Permitted shaft misalignm. and centre offset	V	0.05	0.05	0.05	0.05	0.1
	V_1	0.1	0.15	0.15	0.15	0.2
W		5	5	6	8	8
Z^{H8}		42	52	62	80	100
z		3.5	4.5	5	6	6

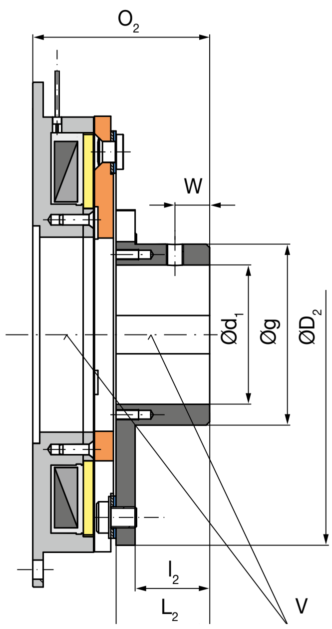
We reserve the right to make dimensional and constructional alterations.

ROBA®-quick electromagnetic brake

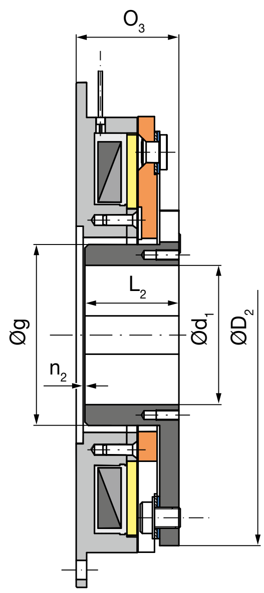
Standard **Sizes 8 – 9** **Type 520.1_0**



Type 520.100
Standard



Type 520.110
Standard with flange hub



Type 520.120
Standard with internal hub

Order number

__ / 5 2 0 . 1 __ 0 / __ / __

Size			Coil voltage [VDC]	Hub * bore $Ø\ d_1$ H7
8	without accessories	0	24	
9	flange hub	1	104	
	internal hub	2		

Example: 8 / 520.110.0 / 24 / 40

* Stated only with flange hub design or internal hub design

Technical data				Size 8	Size 9
Nominal torque [1]	Type 520.1 _0	M_2	[Nm]	320	640
Electrical power		P_{20}	[W]	40	77
Maximum speed		n_{max}	[rpm]	3000	2200
Weight	without accessories	m	[kg]	5.64	6.90
	with flange hub	m	[kg]	13.9	15.63
Mass moment of inertia	Armature disk	I_{eig}	[10^{-4} kgm^2]	81	315
	Flange hub [2] + Armature disk	I_{eig}	[10^{-4} kgm^2]	107	381

1) Please observe run-in conditions or minimum speed (see page 4).
2) With max. bore

Standard voltages 24 VDC; 104 VDC.
Permitted voltage tolerances acc. IEC 38 +/-10 %.

Bores			Size 8	Size 9
$Ød_1$ H7	Preferred bores	[mm]	40; 50	50; 60
	min.	[mm]	24	27
	max.	[mm]	60	80

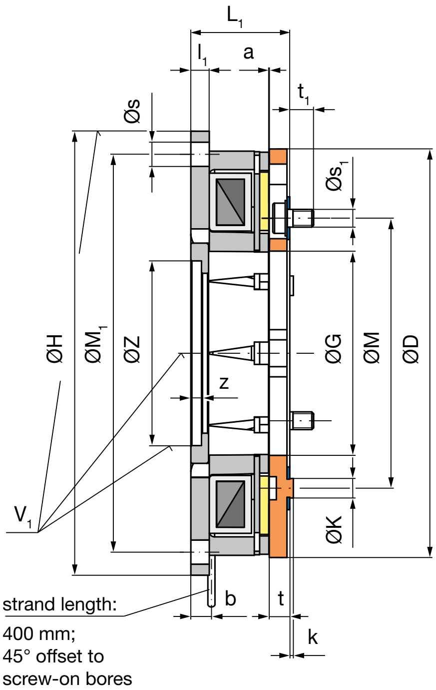
Dimensions [mm]	Size 8	Size 9
a	0.5	0.5
b	16	16
D	193	251
D_2	185	242
f	92	112
G	91	111
g	84	104
H_{h9}	230	290
K	3 x 11.5	4 x 20
k	2	4.2
L_2	45.3	53.9
L_6	40.1	47.9
l_2	36.3	42.9
l_4	5	6

Dimensions [mm]		Size 8	Size 9
l_7		30	35
M		158	210
M_1		215	270
n_2		0.8	1.0
O_2		86.4	101.8
O_3		50.1	58.9
s		4 x 9	4 x 11
s_1		3 x M10	4 x M12
t_1		8.5	11.8
Permitted shaft mis-alignm. and centre offset	V	0.1	0.1
	V_1	0.2	0.25
W		15	20
Z^{H8}		100	125
z		4	4

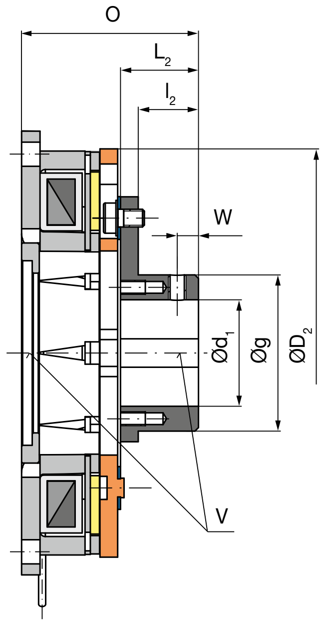
We reserve the right to make dimensional and constructional alterations.

ROBA®-quick electromagnetic brake

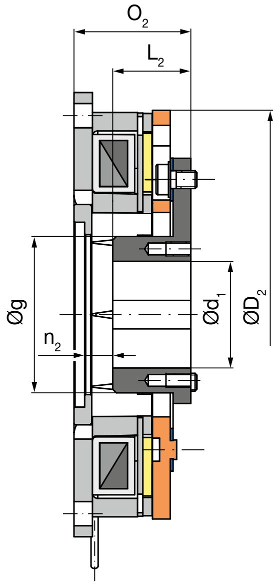
Small mounting diameter **Sizes 3 – 7** **Type 520.21_.0**



Type 520.210.0
Small mounting diameter



Type 520.211.0
Small mounting diameter
and flange hub



Type 520.212.0
Small mounting diameter
and internal hub

Order number

__ / 5 2 0 . 2 1 __ . 0 / __ / __ / __

Size	Type		Coil voltage [VDC]		Hub * bore Ø d_1 H7	Keyway * acc. DIN 6885/1 or DIN 6885/3
3 to 7	without accessories	**0**		**24**		
	flange hub	**1**		**104**		
	internal hub	**2**				

Example: 6 / 520.212.0 / 24 / 35 / DIN 6885/3

* Stated only with flange hub design or internal hub design

Technical data

				Size 3	Size 4	Size 5	Size 6	Size 7
Nominal torque [1]	Type 520.21_.0	M_2	[Nm]	8.5	17	45	80	160
Electrical power		P_{20}	[W]	13	20	31	47	71
Maximum speed		n_{max}	[rpm]	8600	7000	6100	5800	4500
Weight	without accessories	m	[kg]	0.35	0.58	1.2	1.8	3.3
	with flange hub	m	[kg]	0.4	0.65	1.35	2	3.85
Mass moment of inertia	Armature disk	I_{eig}	[10^{-4} kgm²]	0.7	1.79	6.28	15.77	48.1
	Flange hub [2] + Armature disk	I_{eig}	[10^{-4} kgm²]	0.8	1.97	7.19	17.54	55.2

1) Please observe run-in conditions or minimum speed (see page 4).
2) With max. bore

Standard voltages 24 VDC; 104 VDC.
Permitted voltage tolerances acc. IEC 38 +/-10 %.

Bores

			Size 3	Size 4	Size 5	Size 6	Size 7
$Ød_1$ H7	Preferred bores	[mm]	10; 15	17; 20	20; 25	25; 30	30; 40
	min.	[mm]	9	10	13	15	20
	max.	[mm]	17	20	30	35 [3]	45

3) Up to Ø 32 keyway acc. DIN 6885/1, over Ø 32 keyway acc. DIN 6885/3

Dimensions [mm]	Size 3	Size 4	Size 5	Size 6	Size 7
a	0.2	0.2	0.2	0.3	0.3
b	4.5	4	5.5	5.5	7.5
D	73.5	92	115	140	177
D_2	55	70	88	110	140
G	36	49	57.5	74	95
g	27	29.5	44	47	66
H_{h9}	80	100	125	150	190
K	3 x 3.5	3 x 4.5	3 x 5.5	3 x 6.6	3 x 8.8
k	1.6	1.7	2.3	2.7	2.8
L_1	22.1	24.6	28.1	30.9	34.4
L_2	15	20	22	28	32
l_1	3.5	4.3	5.2	6	7
l_2	11.5	16	17	22	25
M	46	60	76	95	120

Dimensions [mm]		Size 3	Size 4	Size 5	Size 6	Size 7
M_1		72	90	112	137	175
n_2		8.5	6.1	7.9	5.5	5.7
O_1		37.1	44.6	50.1	58.9	66.4
O_2		25.6	28.6	33.1	36.9	41.4
s		4 x 4.8	4 x 5.7	4 x 6.8	4 x 6.8	4 x 9.2
s_1		3 x M3	3 x M4	3 x M5	3 x M6	3 x M8
t		3.9	4.4	5.9	6.6	8.1
t_1		4.0	5.2	6.7	8.7	8.2
Permitted shaft misalignm. and centre offset	V	0.05	0.05	0.05	0.05	0.1
	V_1	0.1	0.15	0.15	0.15	0.2
W		5	5	6	8	8
Z^{H8}		35	42	52	62	80
z		2	2.5	3	3.5	3.5

We reserve the right to make dimensional and constructional alterations.

ROBA®-quick electromagnetic brake

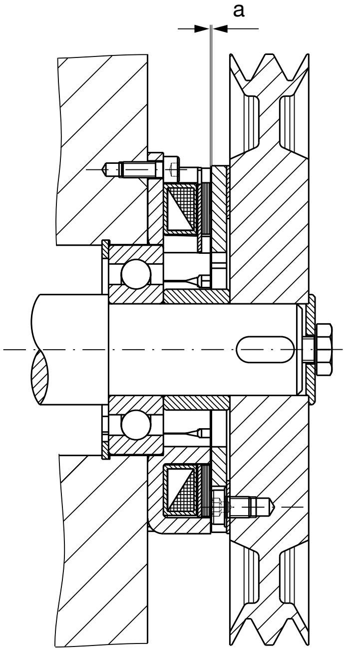


Fig. 1

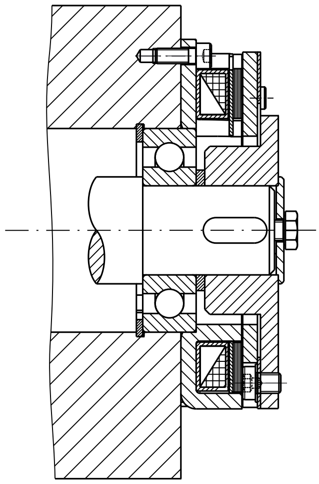


Fig. 2

	Size						
	3	4	5	6	7	8	9
a	$0.2^{+0.1}_{-0.05}$	$0.2^{+0.15}_{-0.05}$	$0.2^{+0.15}_{-0.05}$	$0.3^{+0.15}_{-0.05}$	$0.3^{+0.15}_{-0.05}$	$0.5^{+0.15}_{-0.1}$	$0.5^{+0.15}_{-0.1}$

Table 1 Adjustment of the air gaps

The dimension “a” (Fig. 1) must be adjusted according to Table 1. Please ensure that the shaft is fastened axially, since otherwise the dimension “a” will change and cause the rotor to band against the armature disk or the coil carrier.

Design:

ROBA®-quick electromagnetic brakes are manufactured according to the electric protection IP 54 specification and the class of insulation F up to 155 °C for coil, casting compound, connection strands and the magnetic coil plastic-coated. The friction linings are asbestos-free, the surfaces of coil carrier and flange hub are phosphated. The armature disk is gas nitro-carburized and the transmission spring is made of stainless steel.

ROBA®-quick electromagnetic brakes are used for dry running. The torque is transmitted by friction between armature disk and the iron poles and the friction lining surfaces of the coil carrier.

Please observe in particular the following:

The run-in conditions or the minimum speed must be observed (see page 4).

The friction surfaces have to be absolutely free of oil and grease as otherwise, the torque drops significantly. The air gap “a” (Fig. 1) has to be checked periodically. The brake does not function correctly if the max. working air gap (see Table 4, page 39) is exceeded.

Installation and maintenance must be carried out by trained and qualified specialists.

Brake size calculation

Formulas

1. Drive torque

$$M_A = \frac{9550 \times P_A}{n} \quad [Nm]$$

2. Required torque

$$M_{erf.} \geq K \times M_A \quad [Nm]$$

3. Switchable torque of the clutch (acc. to diagram 1, page 38)

$$M_S \geq M_{erf.} \quad [Nm]$$

4. Mass moment of inertia

$$I = I_{eig.} + I_{zus.} \quad [kgm^2]$$

5. Deceleration torque of the brake

$$M_v = M_S \pm M_L \quad [Nm]$$

6. Deceleration time

$$t_v = \frac{I \times n}{9.55 \times M_v} + t_1 \quad [sec]$$

7. Max. switching frequency per hour (dependent on time)

$$S_{h\,max} = \frac{1}{t_{aM} + (t_v + t_2) \times 1.2} \times 3600 \quad [h^{-1}]$$

8. Friction work per deceleration

$$Q_v = \frac{I \times n^2}{182.4} \times \frac{M_s}{M_v} \quad [J]$$

9. Examination of the selected brake size in diagram 2 (page 38 friction power diagram).
Intersection friction work / switching frequency must be below the friction power curve! If it is above, the next size has to be selected and re-calculated from point 3 on.

$$Q_v < Q_E \quad [J]$$

10. Number of switchings until re-adjustment

$$Z_n = \frac{Q_1}{Q_v} \times (a_n - a) \quad [-]$$

11. Number of switchings until wear limit

$$Z = \frac{Q_{ges.}}{Q_v} \quad [-]$$

Key:

P_A	[kW]	input power	
M_A	[Nm]	drive torque	
M_v	[Nm]	deceleration torque of the brake	
$M_{erf.}$	[Nm]	required torque	
M_L	[Nm]	load torque (+ = lower load) (- = lift load)	
M_S	[Nm]	switchable torque of the brake (diagram 1, page 38)	
n	[rpm]	input speed	
K		safety factor ≥ 2	
I	[kgm²]	mass moment of inertia	
$I_{eig.}$	[kgm²]	own mass moment of inertia (“Technical data”)	
$I_{zus.}$	[kgm²]	additional mass moment of inertia	
t_v	[sec]	deceleration time	
t_{aM}	[sec]	acceleration time of the machine	
t_1	[sec]	switch-on time of the brake	Table 3, page 39
t_2	[sec]	switch-off time of the brake	Table 3, page 39
$S_{h\,max}$	[h⁻¹]	max. switching frequency per hour (dependent on time)	
$Q_{ges.}$	[J]	total friction work (acc. Table 4, page 39)	
Q_v	[J]	friction work per deceleration	
Q_E	[J]	perm. friction work for single switching	Table 4, page 39
Q_1	[J/mm]	friction work until 1 mm wear	Table 4, page 39
Z_n		number of switchings until re-adjustment	
Z		number of switchings until wear limit	
a	[mm]	nominal air gap	Table 4, page 39
a_n	[mm]	max. working air gap	Table 4, page 39

Calculation example

Data:

Input power	P_A	= 3 kW
Input speed	n	= 1400 rpm
Load torque output	M_L	= 15 Nm
Additional mass moment of inertia	$I_{add.}$	= 0.15 kgm²
Acceleration time of the machine	t_{aM}	= 1.5 [sec]
350 switchings per hour		

Drive torque

$$M_A = \frac{9550 \times P_A}{n} = \frac{9550 \times 3}{1400} = \mathbf{20.5} \text{ [Nm]}$$

Required torque

$$M_{erf.} = K \times M_A = 2 \times 20.5 = \mathbf{41} \text{ [Nm]}$$

Determined brake size (acc. to diagram 1) = Size 6

$$M_S \geq M_{erf.} = \mathbf{47} \text{ [Nm]}$$

selected brake = Size 6, Type 520.200.0

Mass moment of inertia

$$I = I_{eig.} + I_{zus.} = 0.001756 + 0.15 = \mathbf{0.151756} \text{ [kgm}^2\text{]}$$

Deceleration torque of the brake

$$M_v = M_S + M_L = 47 + 15 = \mathbf{62} \text{ [Nm]}$$

Deceleration time of the brake

$$t_v = \frac{I \times n}{9.55 \times M_v} + t_1{}^* = \frac{0.151756 \times 1400}{9.55 \times 62} + 0.10 = \mathbf{0.46} \text{ [sec]}$$

* Switching times t_1 und t_2 from Table 3, page 39 = without overexcitation

Max. switching frequency per hour

$$S_{h\,max} = \frac{1}{t_{aM} + (t_v + t_2{}^*) \times 1.2} \times 3600$$

$$S_{h\,max} = \frac{1}{1.5 + (0.46 + 0.060) \times 1.2} \times 3600 = \mathbf{1695} \text{ [h}^{-1}\text{]}$$

Friction work per deceleration

$$Q_v = \frac{I \times n^2}{182.4} \times \frac{M_S}{M_v}$$

$$Q_v = \frac{0.151756 \times 1400^2}{182.4} \times \frac{47}{62} = \mathbf{1236} \text{ [J]} \leq Q_E$$

The point of intersection determined in diagram 2 must be located in or under the characteristic curve of the selected brake.

Switching frequency: 350 switchings per hour = permitted

Number of switchings until re-adjustment

$$Z_n = \frac{Q_1}{Q_v} \times (a_n - a)$$

$$Z_n = \frac{57 \times 10^7}{1236} \times (1.2 - 0.3) = \mathbf{415048} \text{ switchings}$$

Number of switchings until wear limit

$$Z = \frac{Q_{ges.}}{Q_v} = \frac{100 \times 10^7}{1236} = \mathbf{809061} \text{ switchings}$$

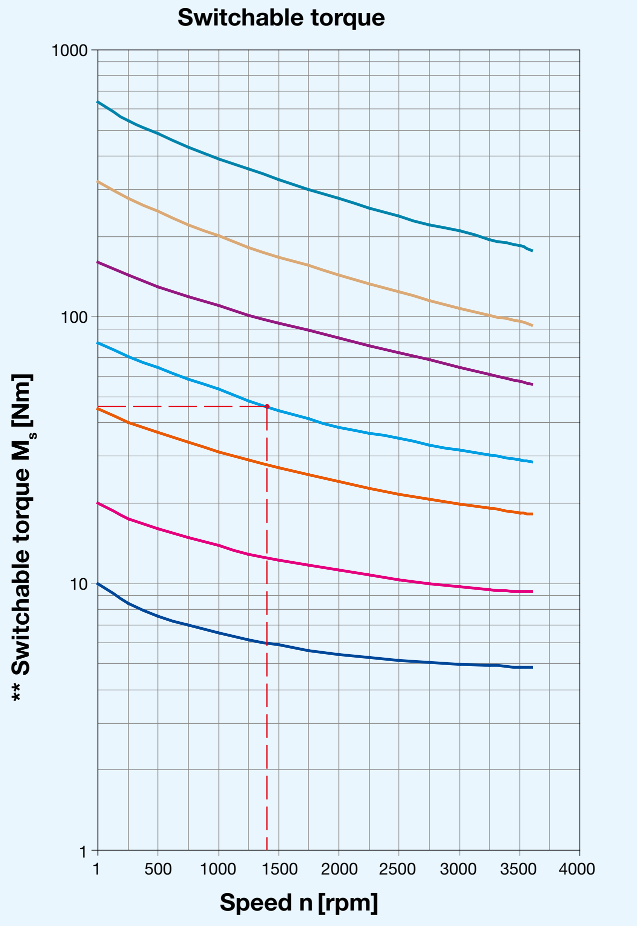


Diagram 1 ** Friction surfaces have been run in

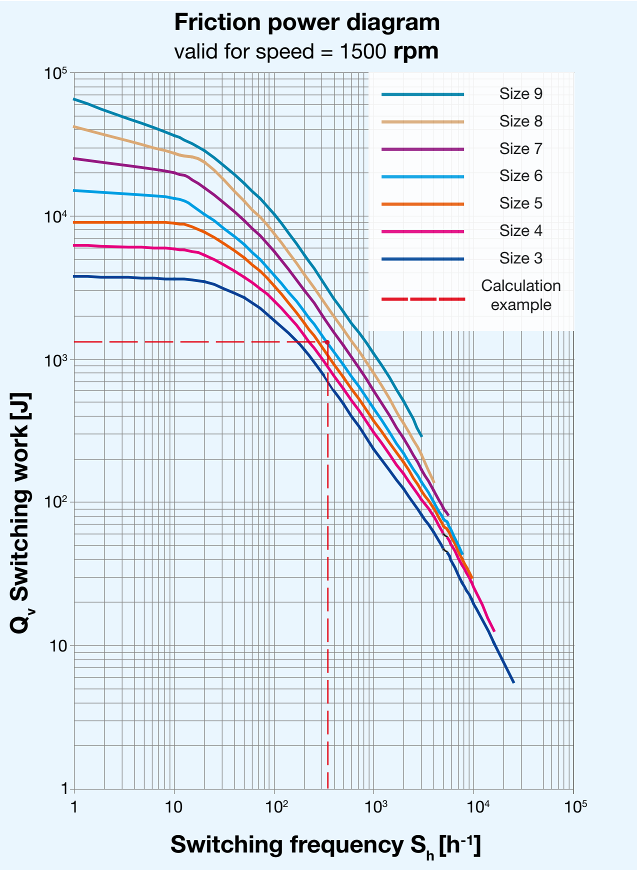


Diagram 2

Switching times

The switching times stated in Table 3 have been determined by comprehensive series of tests. They are valid for switching DC-side with nominal air gap and warm coil. Deviations depend on the respective installation situation, ambient temperatures, release path and the type of rectification with which the corresponding brake is operated.

Switching times				Size 3	4	5	6	7	8	9
without overexcitation	Type 520.___._	t_{11}	[sec]	0.006	0.008	0.010	0.015	0.025	0.027	0.030
		t_1	[sec]	0.035	0.040	0.055	0.100	0.150	0.245	0.330
		t_2	[sec]	0.010	0.018	0.030	0.060	0.090	0.100	0.140
with overexcitation	Type 520.___._	t_{11}	[sec]	0.002	0.003	0.004	0.006	0.008	0.010	0.015
		t_1	[sec]	0.020	0.022	0.030	0.050	0.075	0.120	0.165

Table 3

Please Observe!
The switching times “with overexcitation” are only valid for 10 x nominal voltage (see table 3, page 55).

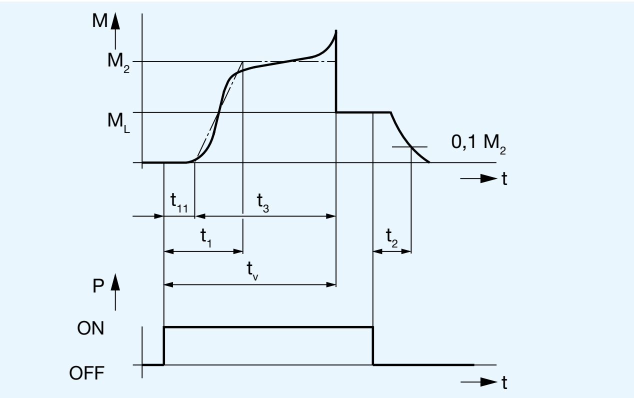


Diagram 3: Torque-Time Diagram

Key:

M_2 = Nominal torque of the brake
M_L = Load torque of the drive
P = Electrical power
t_v = Deceleration time
t_1 = Connection time
t_{11} = Response delay on connection
t_2 = Separation time
t_3 = Slip time

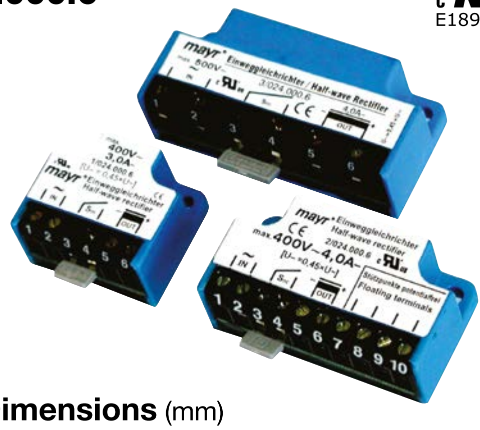
Friction work and air gap				Size 3	4	5	6	7	8	9
Friction work up to 1 mm wear	Type 520.___._	Q_1	[10^7 J/mm]	12.5	20	33	57	100	105	170
Total friction work	Type 520.___._	Q_{ges}	[10^7 J]	12.5	25	50	100	200	185	340
Permitted friction work with a single switching		Q_E	[10^3 J]	3.8	6.2	9	15	25	42	65
Nominal air gap		a	[mm]	0.2	0.2	0.2	0.3	0.3	0.5	0.5
Max. working air gap		a_n	[mm]	0.6	0.8	1.0	1.2	1.5	1.8	2.0

Table 4

Please Observe!
Due to operating parameters such as sliding speed, pressing or temperature the **wear values** can **only be considered guideline values**.

Half-wave and bridge rectifiers Type 02_.000.6

E189728



Application

Rectifiers are used to connect DC consumers to alternating voltage supplies, for example electromagnetic brakes and clutches (ROBA-stop®, ROBA-quick®, ROBATIC®), electromagnets, electrovalves, contactors, switch-on safe DC motors, etc.

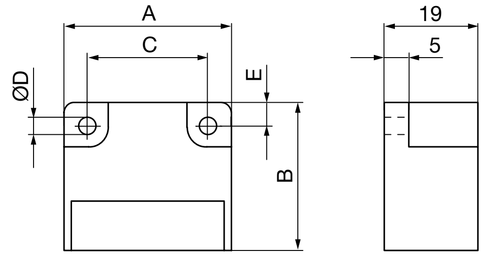
Function

The AC input voltage (VAC) is rectified (VDC) in order to operate DC voltage units. Also, voltage peaks, which occur when switching off inductive loads and which may cause damage to insulation and contacts, are limited and the contact load reduced.

Electrical connection (Terminals)

1 + 2	Input voltage
3 + 4	Connection for an external switch for DC-side switching
5 + 6	Coil
7 – 10	Free nc terminals (only for Size 2)

Dimensions (mm)



Size	A	B	C	ØD	E
1	34	30	25	3.5	4.5
2	54	30	44	4.5	5.0
3/4	64	30	54	4.5	5.0

Accessories: Mounting bracket set for 35 mm rail acc. EN 60715: Article-No 1803201.

Order number

__ / 0 2 __ . 0 0 0 . 6

Sizes	
1 to 4	

4	Half-wave rectifier
5	Bridge rectifier

Technical data

				Bridge rectifier		Half-wave rectifier			
Calculation output voltage				VDC = VAC x 0.9		VDC = VAC x 0.45			
Type				**1/025**	**2/025**	**1/024**	**2/024**	**3/024**	**4/024**
Max. input voltage	± 10%	U_{AC}	[VAC]	230	230	400	400	500	600
Max. output voltage		U_{DC}	[VDC]	207	207	180	180	225	270
Output current	≤ 50°C	I_{RMS}	[A]	2.5	2.5	3.0	4.0	4.0	4.0
	at max. 85 °C	I_{RMS}	[A]	1.7	1.7	1.8	2.4	2.4	2.4
Max. coil nominal capacity at U_{AC} = 115 VAC	≤ 50 °C	P_{nenn}	[W]	260	260	-	-	-	-
	up to 85 °C	P_{nenn}	[W]	177	177	-	-	-	-
U_{AC} = 230 VAC	≤ 50 °C	P_{nenn}	[W]	517	517	312	416	416	416
	up to 85 °C	P_{nenn}	[W]	352	352	187	250	250	250
U_{AC} = 400 VAC	≤ 50 °C	P_{nenn}	[W]	-	-	540	720	720	720
	up to 85 °C	P_{nenn}	[W]	-	-	324	432	432	432
U_{AC} = 500 VAC	≤ 50 °C	P_{nenn}	[W]	-	-	-	-	900	900
	up to 85 °C	P_{nenn}	[W]	-	-	-	-	540	540
U_{AC} = 600 VAC	≤ 50 °C	P_{nenn}	[W]	-	-	-	-	-	1080
	up to 85 °C	P_{nenn}	[W]	-	-	-	-	-	648
Peak reverse voltage			[V]	1600	1600	2000	1600	2000	2000
Rated insulation voltage		U_{RMS}	$[V_{RMS}]$	320	320	500	500	630	630
Pollution degree (insulation coordination)				1	1	1	1	1	1
Device fuses				To be included in the input voltage line.					
Recommended microfuse switching capacity H The microfuse corresponds to the max. possible connection capacity. If fuses are used corresponding to the actual capacities, the permitted limit integral I²t must be observed on selection.				FF 3.15 A	FF 3.15 A	FF 4 A	FF 5 A	FF 5 A	FF 5 A
Permitted limit integral		I^2t	$[A^2s]$	40	40	50	100	50	50
Protection				IP65 components, encapsulated / IP20 terminals					
Terminals				Cross-section 0.14 - 1.5 mm² (AWG 26-14)					
Ambient temperature			[°C]	-25 to +85					
Storage temperature			[°C]	-40 to +85					
Conformity markings				UL, CE	UL, CE	UL, CE	UL, CE	UL, CE	CE
Installation conditions				The installation position can be user-defined. Please ensure sufficient heat dissipation and air convection! Do not install near to sources of intense heat!					

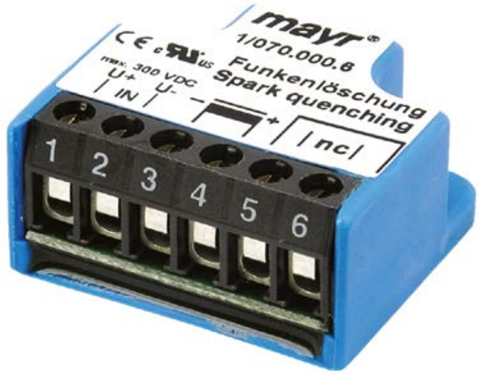
Spark quenching unit Type 070.000.6

E189728

Application

Reduces spark production on the switching contacts occurring during DC-side switch-off of inductive loads.

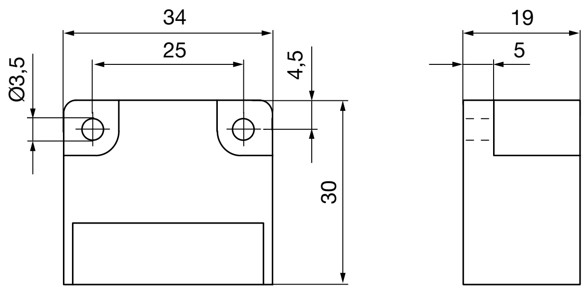
- Voltage limitation according to VDE 0580 2000-07, Item 4.6.
- Reduction of EMC-disturbance by voltage rise limitation, suppression of switching sparks.
- Reduction of brake engagement times by a factor of 2-4 compared to free-wheeling diodes.



Function

The spark quenching unit will absorb voltage peaks resulting from inductive load switching, which can cause damage to insulation and contacts. It limits these to 70 V and reduces the contact load. Switching products with a contact opening distance of > 3 mm are suitable for this purpose.

Dimensions (mm)



Electrical Connection (Terminals)

1 (+)	Input voltage
2 (–)	Input voltage
3 (–)	Coil
4 (+)	Coil
5	Free nc terminal
6	Free nc terminal

Technical data

Input voltage	max. 300 VDC, max. 615 V_{peak} (rectified voltage 400 VAC, 50 / 60 Hz)
Switch-off energy	max. 9 J / 2 ms
Power dissipation	max. 0.1 Watt
Rated voltage nc terminals	250 V
Protection	IP65 / IP20 terminals
Ambient temperature	-25 °C up to +85 °C
Storage temperature	-25 °C up to +105 °C
Max. conductor cross-section	2.5 mm² / AWG 26-12
Max. terminal tightening torque	0.5 Nm

Accessories

Mounting bracket set for 35 mm mounting rail acc. EN 60715: Article No. 1803201

Order number

__ / 0 7 0 . 0 0 0 . 6

Size
1

ROBA®-takt clutch brake module

The clutch brake module for positioning and synchronising

- ❑ **Energy-saving and environmentally-friendly**
- ❑ **Positioning accuracy for the entire service lifetime**
- ❑ **High switching frequency**
- ❑ **Maintenance-free during the entire service lifetime**
- ❑ **Low-noise**
- ❑ **Sealed**
- ❑ **Individual variants**
  - without flange
  - with cast IEC-flange
  - with hollow shaft

Maintenance-free/ no manual re-adjustment

- Constant switching behav-iour, i.e. high positioning accuracy and freedom from maintenance over the entire service lifetime
- No downtime due to re-adjustment

High radial shaft end loads

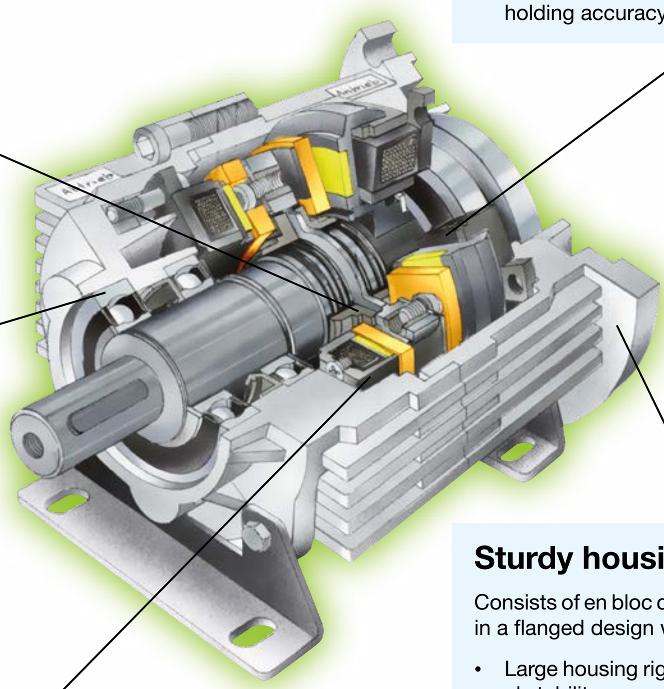
Strengthened bearings

- High radial loads of the input and output shafts permitted

Heat dissipation

Optimized heat dissipation and large cooling ribs

- Optimum operation temperature due to dissipation of the frictional heat
- Constant characteristic operating data



Low leakage flux/ high friction power

Larger magnetic and friction surfaces (asbestos free) with the same dimensions due to the new technology of the clutches and brakes

- Optimised electromagnetic effect, i.e. low leakage flux, faster switching behaviour, less heat build-up and, therefore, constant holding accuracy

Sturdy housing

Consists of en bloc cast two part ribbed housing, in a flanged design with cast flanges

- Large housing rigidity guarantees dimension-al stability, even with loads not caused under regular conditions (for example weight load by people)

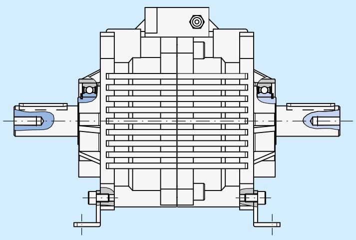
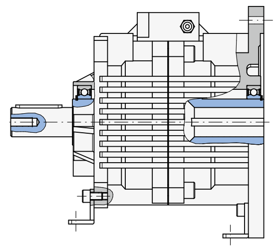
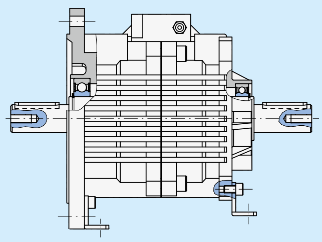
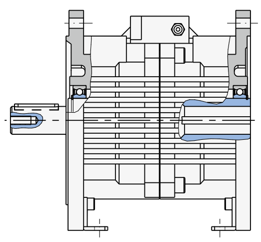
Functional principle

The **ROBA®-takt** clutch brake module is an electromagnetic clutch brake unit. Whilst the drive machine runs through continuously, it generates cycle operation via alternating coupling and braking actions.
ROBA®-takt clutch brake modules guarantee high cycle times.

Due to the completely enclosed construction (Protection IP55), conceived acc. VDE/IEC directives, the **ROBA®-takt** clutch brake module is ideal for all standardized motors and gearboxes.
This means that many different installation positions are possible.

Due to the patented principle of self-readjustment, the **ROBA®-takt** clutch brake module is accurately positioned and maintenance-free over the entire service lifetime.

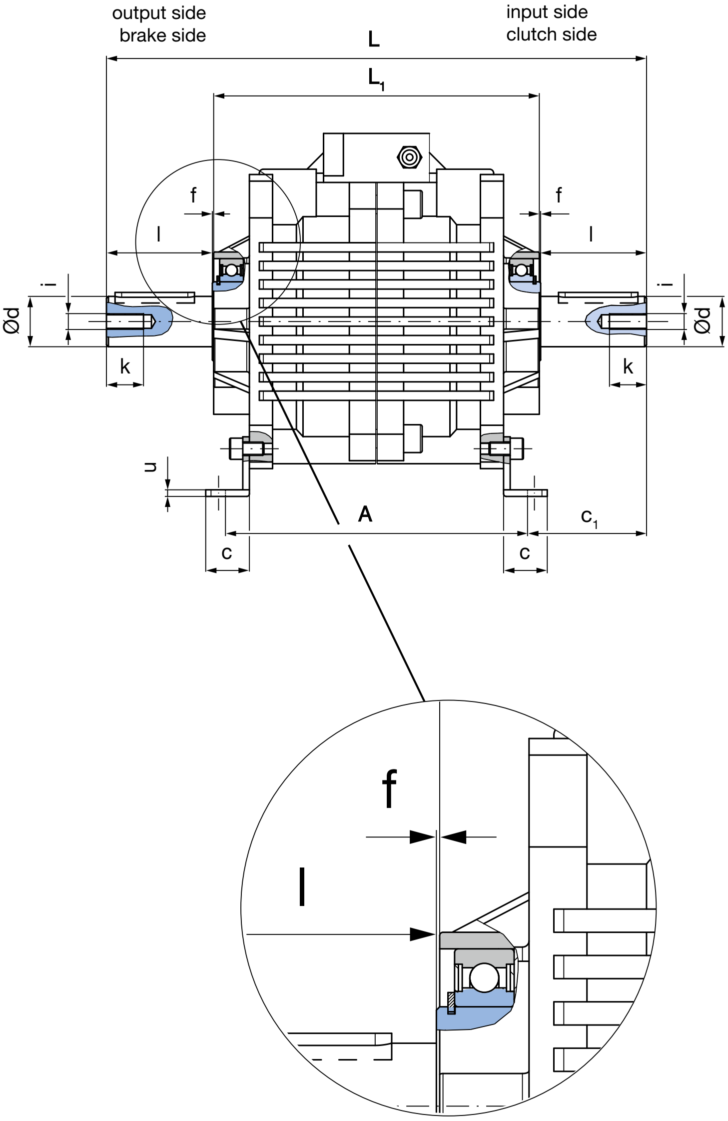
Summary of constructional designs ROBA®-takt

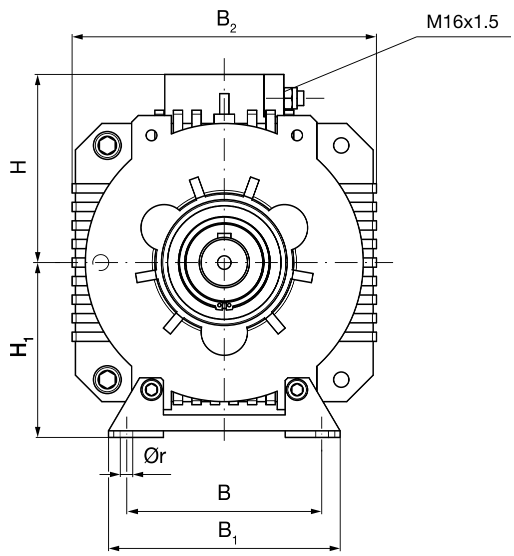
Design	Sizes / Type	Version		Type No.
ROBA®-takt  without flange/shaft, without flange/shaft	Sizes 3 to 7 Type 674.0_4.0	without feet with feet	Type Type	674.004.0 674.014.0 **Pages 44 – 45**
ROBA®-takt  without flange/shaft, IEC-flange/hollow shaft	Sizes 3 to 7 Type 674.0_ _.0	without feet IEC-flange small IEC-flange large with feet IEC-flange small IEC-flange large	 Type Type Type Type	 674.005.0 674.006.0 674.015.0 674.016.0 **Pages 46 – 47**
ROBA®-takt  IEC-flange/shaft, without flange/shaft	Sizes 3 to 7 Type 67_.0_4.0	without feet IEC-flange small IEC-flange large with feet IEC-flange small IEC-flange large	 Type Type Type Type	 675.004.0 676.004.0 675.014.0 676.014.0 **Pages 48 – 49**
ROBA®-takt  IEC-flange/shaft, IEC-flange/hollow shaft	Sizes 3 to 7 Type 67_.0_ _.0	without feet IEC-flange small/small IEC-flange small/large IEC-flange large/small IEC-flange large/large with feet IEC-flange small/small IEC-flange small/large IEC-flange large/small IEC-flange large/large	 Type Type Type Type Type Type Type Type	 675.005.0 675.006.0 676.005.0 676.006.0 675.015.0 675.016.0 676.015.0 676.016.0 **Pages 50 – 51**

Additional designs are available on request.

ROBA®-takt clutch brake module

Sizes 3 – 7 **Type 674.0_4.0**





Order number

__	/ 6 7 4 . 0	__	4 . 0 /	__	/ W __	/ W __	with control unit
▲		▲		▲	▲	▲	▲
Sizes 3 to 7	without feet with feet	**0** **1**	Coil voltage [VDC]	**24** **104**	output * shaft Ø d k6	input * shaft Ø d k6	see pages 56 – 58

Example: 5 / 674.014.0 / 24 / W24 / W24

* Special dimensions on request

Technical data				Size				
				3	4	5	6	7
Nominal torque	Clutch	M_2	[Nm]	10	20	45	80	160
	Brake	M_2	[Nm]	8.5	17	45	80	160
Electrical power	Clutch	P_{20}	[W]	17	25	30	44	79
	Brake	P_{20}	[W]	13	23	30	45	70
Maximum speed		n_{max}	[rpm]	3600	3600	3600	3600	3600
Weight	Type 674.014.0	m	[kg]	3.9	6.8	9.9	15.3	27.7
Mass moment of inertia	Output Type 674.014.0	I	[10^{-4} kgm^2]	2.5	6.37	21.5	60.5	138

Standard voltages 24 VDC; 104 VDC.
Permitted voltage tolerances acc. IEC 38 +/-10 %.

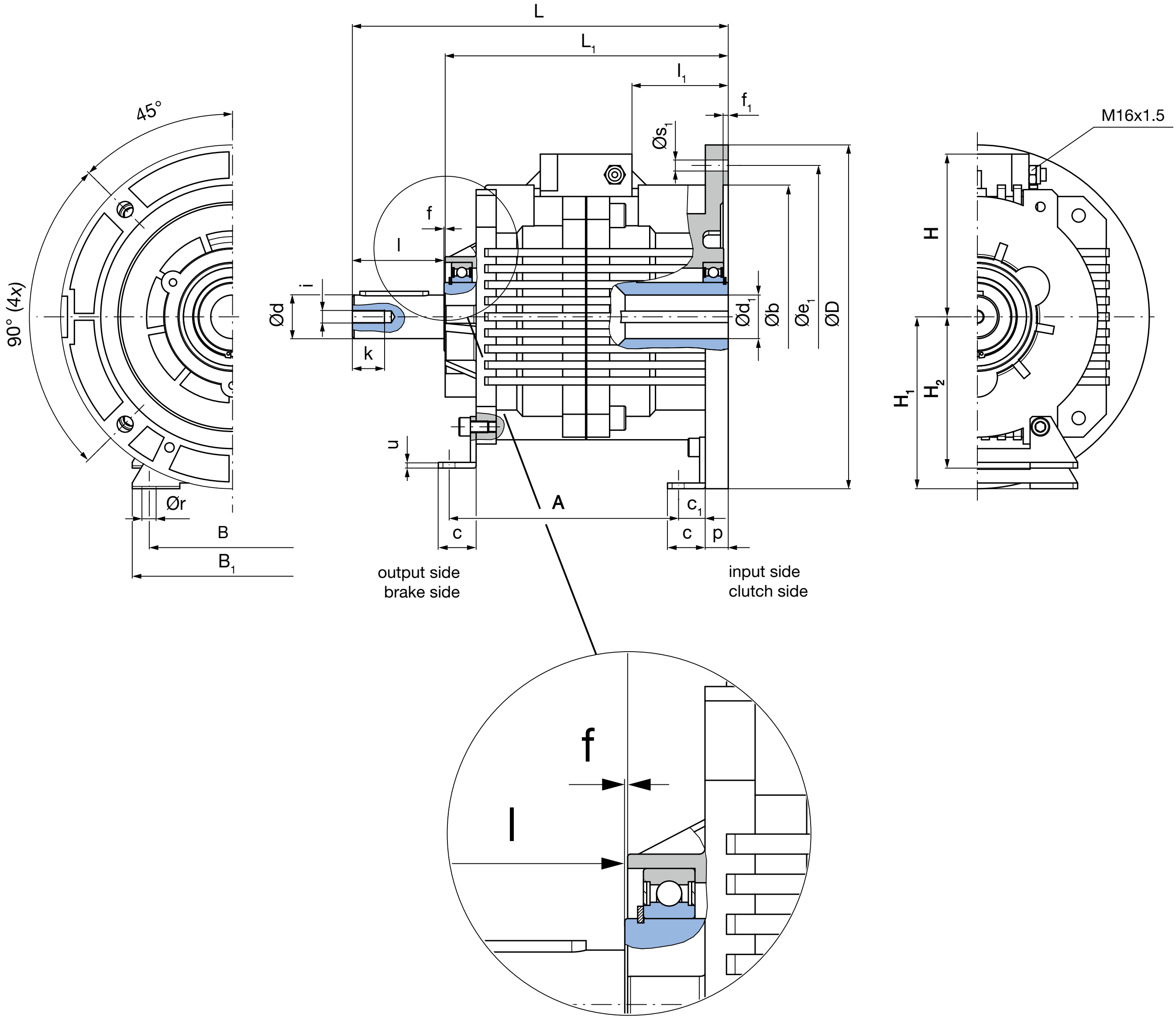
Dimensions [mm]	Size				
	3	4	5	6	7
A	126	146	165	189	233
B	75	95	110	120	145
B_1	93	115	136	152	175
B_2	114	127	156	179	230
c	19	22	28	28	33
c_1	37	46.5	57	67	89
d_{k6}	14	19	24	28	38
f	1	1	1	1	1
H	86	94	106	121	142

Dimensions [mm]	Size				
	3	4	5	6	7
H_1	63	80	90	100	132
i	M5	M6	M8	M10	M12
k	12.5	16	19	22	28
L	200	239	279	323	408
L_1	138	157	177	201	246
l	30	40	50	60	80
r	6.6	9	11	11	14
u	3	3	4	4	5

We reserve the right to make dimensional and constructional alterations.

ROBA®-takt clutch brake module

Sizes 3 – 7 **Type 674.0_ _.0**



Order number

Clutch side
IEC-flange small **5**
IEC-flange large **6**

__ / 6 7 4 . 0 __ __ . 0 / __ / W__ / B__ with control unit

Sizes	Feet	Coil voltage [VDC]	output shaft * Ø d k6	input hollow shaft bore * Ø d_1 F8	with control unit
3 to 7	without feet **0** with feet **1**	**24** **104**	output shaft * Ø d $_{k6}$	input hollow shaft bore * Ø d_1 ^{F8}	see pages 56 – 58

Example: 4 / 674.015.0 / 24 / W19 / B24

* Special dimensions on request

Sizes 3 – 7 **Type 674.0_ _.0**

Technical data				Size 3	Size 4	Size 5	Size 6	Size 7
Nominal torque	Clutch	M_2	[Nm]	10	20	45	80	160
	Brake	M_2	[Nm]	8.5	17	45	80	160
Electrical power	Clutch	P_{20}	[W]	17	25	30	44	79
	Brake	P_{20}	[W]	13	23	30	45	70
Maximum speed		n_{max}	[rpm]	3600	3600	3600	3600	3600
Weight	Type 674.014.0	m	[kg]	3.9	6.8	9.9	15.3	27.7
Mass moment of inertia	Output Type 674.014.0	I	[10^{-4} kgm²]	2.5	6.37	21.5	60.5	138

Standard voltages 24 VDC; 104 VDC.
Permitted voltage tolerances acc. IEC 38 +/-10 %.

Dimensions IEC [mm]	Size 3		Size 4		Size 5		Size 6		Size 7	
optionally with small or large IEC-flange	IEC-small	IEC-large	IEC-small	IEC-large	IEC-small	IEC-large	IEC-small	IEC-large	IEC-small	IEC-large
D	140	160	160	200	200	200	200	250	250	300
d_1 F8	11	14	14	19	19	24	24	28	28	38
$b^{+0.5}_{+0.3}$	95	110	110	130	130	130	130	180	180	230
e_1	115	130	130	165	165	165	165	215	215	265
f_1	3.5	4	4	4	4	4	4	4.5	4.5	4.5
H_1 1)	70	80	80	100	100	100	100	125	125	150
l_1	25	32	32	42	42	55	55	65	65	90
s_1	9	9	9	11	11	11	11	14	14	14

Dimensions [mm]	Size 3	Size 4	Size 5	Size 6	Size 7
A	110	126	140	164	198
B	75	95	110	120	145
B_1	93	115	136	152	175
c	19	22	28	28	33
c_1	11	13.5	18	18	21
d_{k6}	14	19	24	28	38
f	1	1	1	1	1
H	86	94	106	121	142
H_2 1)	63	80	90	100	132

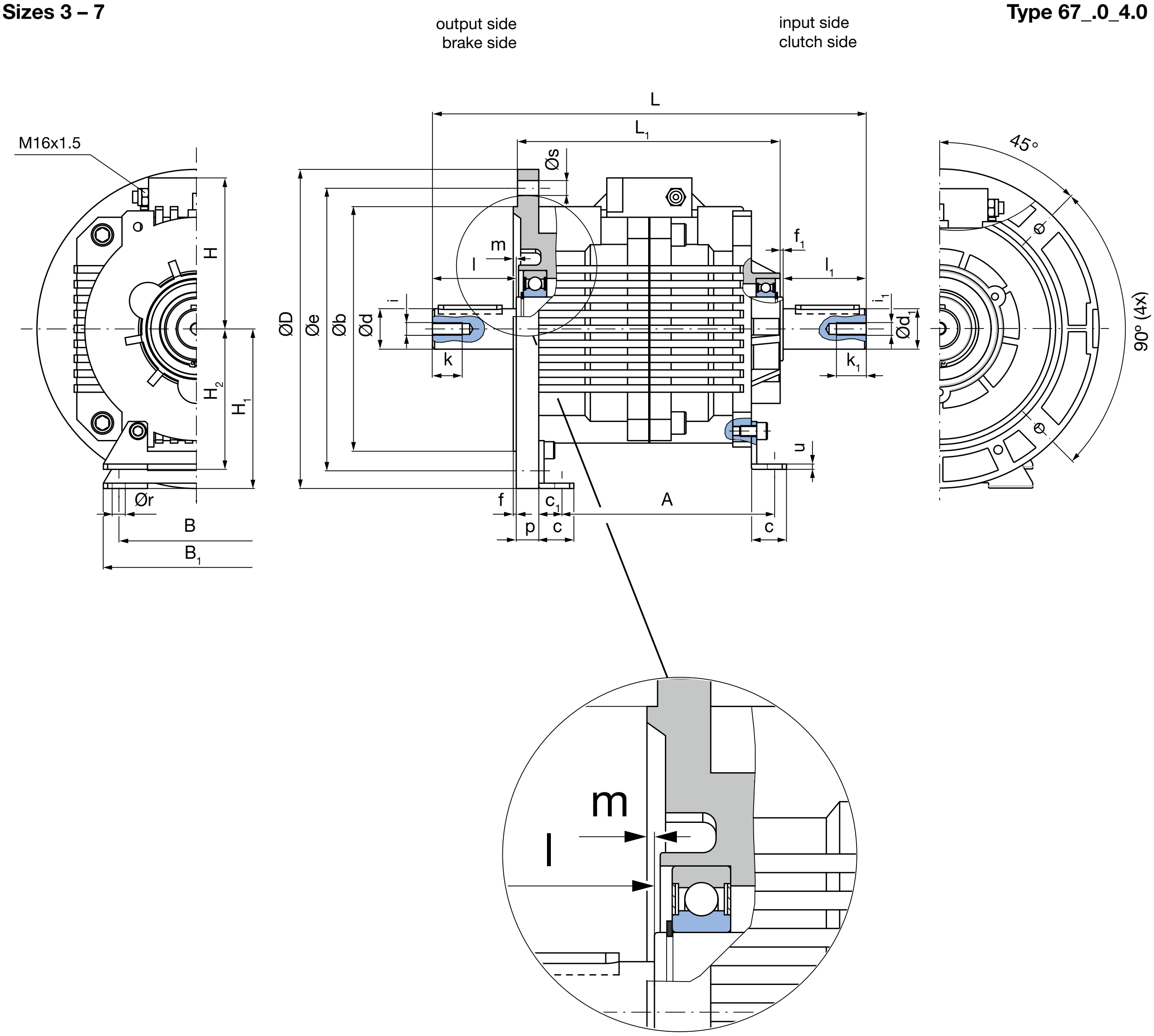
1) Please observe the difference in height of the feet input side and output side.

Dimensions [mm]	Size 3	Size 4	Size 5	Size 6	Size 7
i	M5	M6	M8	M10	M12
k	12.5	16	19	22	28
L	170	199	229	263	328
L_1	139	158	178	202	247
l	30	40	50	60	80
p	12	13	14	14	20
r	6.6	9	11	11	14
u	3	3	4	4	5

We reserve the right to make dimensional and constructional alterations.

ROBA®-takt clutch brake module

Sizes 3 – 7 **Type 67_.0_4.0**



Order number

Brake side

IEC-flange small	5
IEC-flange large	6

__ / 6 7 __ . 0 __ 4 . 0 / __ / W __ / W __   with control unit

Sizes			Coil voltage [VDC]	output shaft *	input shaft *	with control unit
3 to 7	without feet	**0**	**24**	Ø d k6	Ø d_1 k6	see pages 56 – 58
	with feet	**1**	**104**			

Example: 4 / 675.014.0 / 24 / W14 / W19

* Special dimensions on request

Technical data				Size				
				3	4	5	6	7
Nominal torque	Clutch	M_2	[Nm]	10	20	45	80	160
	Brake	M_2	[Nm]	8.5	17	45	80	160
Electrical power	Clutch	P_{20}	[W]	17	25	30	44	79
	Brake	P_{20}	[W]	13	23	30	45	70
Maximum speed		n_{max}	[rpm]	3600	3600	3600	3600	3600
Weight	Type 674.014.0	m	[kg]	3.9	6.8	9.9	15.3	27.7
Mass moment of inertia	Output Type 674.014.0	I	[10^{-4} kgm²]	2.5	6.37	21.5	60.5	138

Standard voltages 24 VDC; 104 VDC.
Permitted voltage tolerances acc. IEC 38 +/-10 %.

Dimensions IEC [mm]	Size									
	3		4		5		6		7	
optionally with small or large IEC-flange	IEC-small	IEC-large	IEC-small	IEC-large	IEC-small	IEC-large	IEC-small	IEC-large	IEC-small	IEC-large
D	140	160	160	200	200	200	200	250	250	300
d_{k6}	11	14	14	19	19	24	24	28	28	38
b_{j6}	95	110	110	130	130	130	130	180	180	230
e	115	130	130	165	165	165	165	215	215	265
f	3	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4
H_1 1)	70	80	80	100	100	100	100	125	125	150
i	M4	M5	M5	M6	M6	M8	M8	M10	M10	M12
k	10	12.5	12.5	16	16	19	19	22	22	28
L	193	200	229	239	269	279	313	323	388	408
l	23	30	30	40	40	50	50	60	60	80
m	3	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4
s	9	9	9	11	11	11	11	14	14	14

Dimensions [mm]	Size				
	3	4	5	6	7
A	110	126	140	164	198
B	75	95	110	120	145
B_1	93	115	136	152	175
c	19	22	28	28	33
c_1	11	13.5	18	18	21
$d_{1\ k6}$	14	19	24	28	38
f_1	1	1	1	1	1
H	86	94	106	121	142

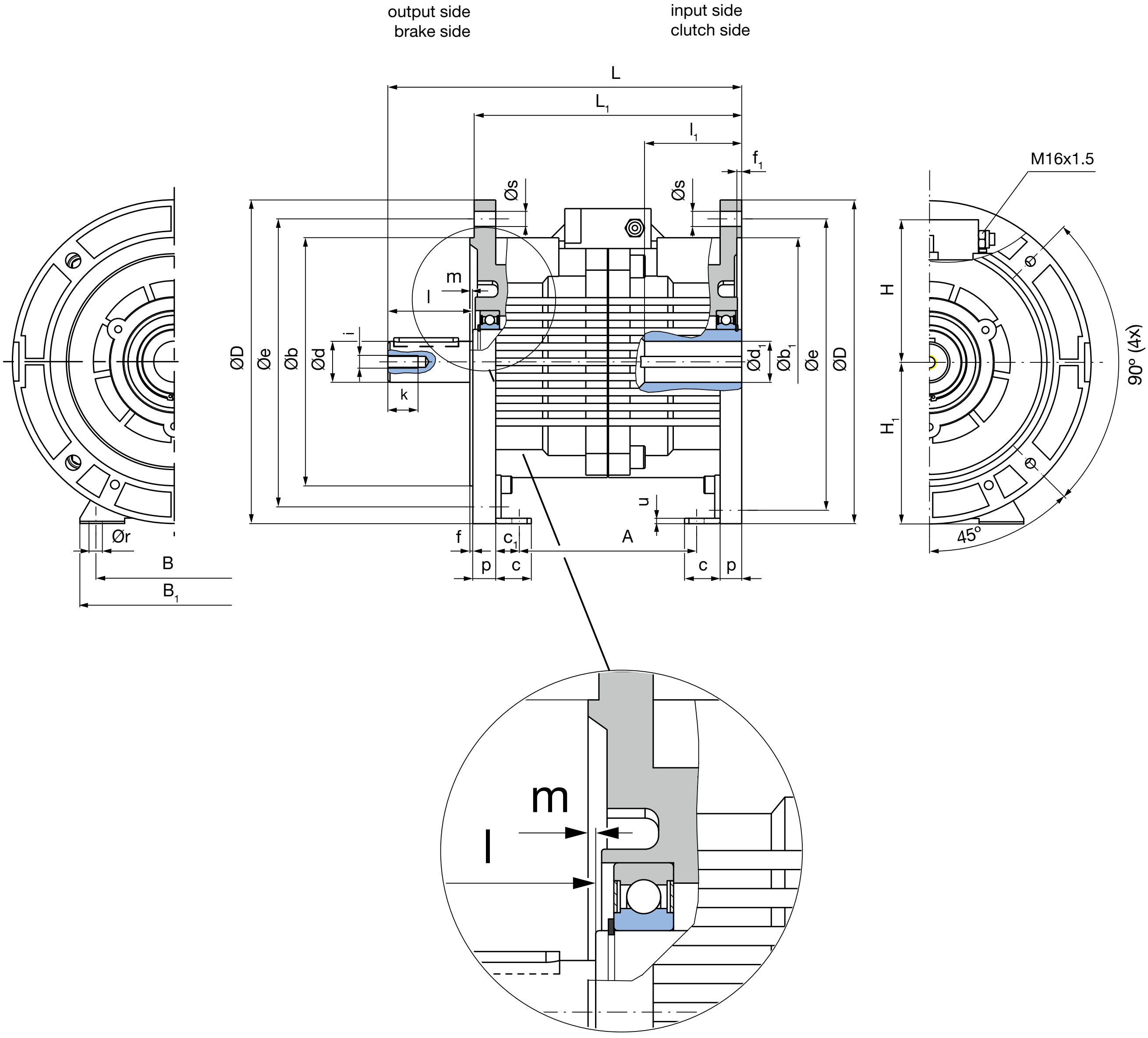
Dimensions [mm]	Size				
	3	4	5	6	7
H_2 1)	63	80	90	100	132
i_1	M5	M6	M8	M10	M12
k_1	12.5	16	19	22	28
L_1	139	158	178	202	247
l_1	30	40	50	60	80
p	12	13	14	14	20
r	6.6	9	11	11	14
u	2.5	3	3	3	4

1) Please observe the difference in height of the feet input side and output side.

We reserve the right to make dimensional and constructional alterations.

ROBA®-takt clutch brake module

Sizes 3 – 7 **Type 67_.0_ _.0**



Order number

Brake side		Clutch side	
IEC-flange small	5	IEC-flange small	5
IEC-flange large	6	IEC-flange large	6

__ / 6 7 __ . 0 __ __ . 0 / __ / W__ / B__ (with control unit)

Sizes			Coil voltage [VDC]		output shaft *	input hollow shaft bore *	with control unit
3 to 7	without feet	0		24	$Ø\ d_{k6}$	$Ø\ d_{1\ F8}$	see pages 56 – 58
	with feet	1		104			

Example: 7 / 675.015.0 / 24 / W28 / B28

* Special dimensions on request

Technical data				Size				
				3	4	5	6	7
Nominal torque	Clutch	M_2	[Nm]	10	20	45	80	160
	Brake	M_2	[Nm]	8.5	17	45	80	160
Electrical power	Clutch	P_{20}	[W]	17	25	30	44	79
	Brake	P_{20}	[W]	13	23	30	45	70
Maximum speed		n_{max}	[rpm]	3600	3600	3600	3600	3600
Weight	Type 674.014.0	m	[kg]	3.9	6.8	9.9	15.3	27.7
Mass moment of inertia	Output Type 674.014.0	I	[10^{-4} kgm^2]	2.5	6.37	21.5	60.5	138

Standard voltages 24 VDC; 104 VDC.
Permitted voltage tolerances acc. IEC 38 +/-10 %.

Dimensions IEC [mm]	Size									
	3		4		5		6		7	
optionally with small or large IEC-flange	IEC-small	IEC-large	IEC-small	IEC-large	IEC-small	IEC-large	IEC-small	IEC-large	IEC-small	IEC-large
D	140	160	160	200	200	200	200	250	250	300
d_{k6}	11	14	14	19	19	24	24	28	28	38
d_1^{F8}	11	14	14	19	19	24	24	28	28	38
b_{j6}	95	110	110	130	130	130	130	180	180	230
$b_1{}^{+0.5}_{+0.3}$	95	110	110	130	130	130	130	180	180	230
e	115	130	130	165	165	165	165	215	215	265
f	3	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4
f_1	3.5	4	4	4	4	4	4	4.5	4.5	4.5
H_1 1)	70	80	80	100	100	100	100	125	125	150
i	M4	M5	M5	M6	M6	M8	M8	M10	M10	M12
k	10	12.5	12.5	16	16	19	19	22	22	28
L	163	170	189	199	219	229	253	263	308	328
l	23	30	30	40	40	50	50	60	60	80
l_1	25	32	32	42	42	55	55	65	65	90
m	3	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4
s	9	9	9	11	11	11	11	14	14	14

1) The difference in height of feet depends on the flange diameter.

Dimensions [mm]	Size				
	3	4	5	6	7
A	94	106	115	139	166
B	75	95	110	120	145
B_1	93	115	136	152	175
c	19	22	28	28	33
c_1	11	13.5	18	18	21

Dimensions [mm]	Size				
	3	4	5	6	7
H	86	94	106	121	142
L_1	140	159	179	203	248
p	12	13	14	14	20
r	6.6	9	11	11	14
u	3	3	4	4	5

We reserve the right to make dimensional and constructional alterations.

Technical explanations
ROBA®-takt clutch brake module

Permitted shaft load

The drive elements located on the shafts exert a radial load during operation which has to be absorbed by the bearings of the unit.

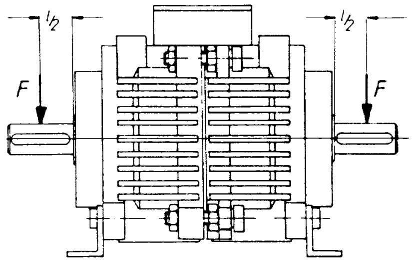


Fig. 1

The force value is limited by the required bearing service lifetime and by the shaft strength (Table 1).

ROBA®-takt max. permitted radial force F_{max} [N]	Size				
	3	4	5	6	7
Drive shaft without IEC-flange	333	995	2150	2705	5355
Output shaft without IEC-flange	333	1105	2331	2950	6211
Output shaft small IEC-flange	-	-	-	-	-
Output shaft large IEC-flange	333	1105	2331	2950	6211

Table 1: Max. permitted radial force F_{max} limited due to the strength of the shaft, force application midway along shaft.

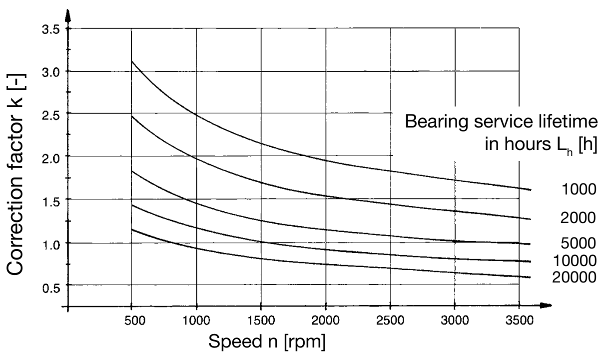


Diagram 1

For determining the permitted radial force, the force application is assumed to apply in the centre of the shaft. If additional axial forces occur, extensive calculation is necessary (please contact mayr power transmission).

The permitted radial forces are stated in Table 2.

ROBA®-takt Radial force F_N [N]	Size				
	3	4	5	6	7
Drive shaft without IEC-flange	436	547	681	819	1149
Output shaft without IEC-flange	788	1052	1484	1685	2861
Output shaft small IEC-flange	840	1134	1586	1785	3115
Output shaft large IEC-flange	788	1052	1484	1685	2861

Table 2: Permitted radial force F_N with speed n = 1500 rpm, bearing service lifetime L_h = 10 000 hours assuming force application midway along shaft.

For different speed or bearing service lifetime values, the permitted force F can be calculated using the factor k. The factor k can be determined using Diagram 1.

$$F = k \times F_N \leq F_{max} \quad [N]$$

F in N = Permitted radial force

k = Correction factor (diagram 1)

F_N in N = Permitted radial force with speed n = 1500 rpm and bearing service lifetime L_h = 10 000 hours (Table 2)

F_{max} in N = Max. permitted radial force, limited due to shaft strength (Table 1)

Clutch brake modul size calculation

Formulas

Basis: M_L = constant
M_S = constant

1. Drive torque

$$M_A = \frac{9550 \times P_A}{n} \qquad \text{[Nm]}$$

2. Required torque

$$M_{erf.} \geq K \times M_A \qquad \text{[Nm]}$$

3. Pre-selection of the unit size acc. diagram 1 page 54

$$M_S \geq M_{erf.} \qquad \text{[Nm]}$$

4. Mass moment of inertia

$$I = I_{eig.} + I_{zus.} \qquad \text{[kgm}^2\text{]}$$

5. Acceleration time input side ($M_A \geq M_S$)

$$t_a = \frac{I \times n}{9.55 \times (M_S \overset{(+)}{-} M_L)} + t_1{}^{1)} \qquad \text{[sec]}$$

6. Deceleration time output side

$$t_v = \frac{I \times n}{9.55 \times (M_S \overset{+}{(-)} M_L)} + t_1{}^{2)} \qquad \text{[sec]}$$

7. Max. switching frequency per hour (dependent on time)

$$S_{h\,max} = \frac{1}{(t_v + t_a) \times 1.2} \times 3600 \qquad [h^{-1}]$$

8. Friction work per acceleration

$$Q_a = \frac{I \times n^2}{182.4} \times \frac{M_s}{M_S \overset{(+)}{-} M_L} \qquad \text{[J]}$$

$$Q_a < Q_E \qquad \text{[J]}$$

9. Friction work per deceleration

$$Q_v = \frac{I \times n^2}{182.4} \times \frac{M_s}{M_S \overset{+}{(-)} M_L} \qquad \text{[J]}$$

$$Q_v < Q_E \qquad \text{[J]}$$

10. Check the selected unit size
in diagram 2 (page 54 friction power diagram).
The point of intersection of friction work (switching work) / switching frequency must be below the friction power curve!
If it is above, the next size has to be selected and re-calculated from point 3 on.

11. Number of switchings until wear limit

$$Z = \frac{Q_{ges.}}{{}^*\,Qa\,(Q_v) \times 2} \qquad [-]$$

* Q_a/Q_v - put in higher value

Key:

P_A	[kW]	input power	
M_A	[Nm]	drive torque	
$M_{erf.}$	[Nm]	required torque	
M_L	[Nm]	load torque ($\overset{(+)}{-}$ / $\overset{+}{(-)}$ = lower load) Sign in brackets is valid if load is lowered	
M_S	[Nm]	switchable torque (diagram 1, page 54)	
n	[rpm]	input speed	
K		safety factor ≥ 2	
I	[kgm²]	mass moment of inertia	
$I_{eig.}$	[kgm²]	own mass moment of inertia (“Technical data”)	
$I_{zus.}$	[kgm²]	additional mass moment of inertia	
t_a	[sec]	acceleration time (input side)	
t_v	[sec]	deceleration time (output side)	
$t_1{}^{1)}$	[sec]	switching time of the clutch	Table 3, page 55
$t_1{}^{2)}$	[sec]	switching time of the brake	Table 3, page 55
$S_{h\,max}$	[h⁻¹]	max. switching frequency per hour (dependent on time)	
$Q_{ges.}$	[J]	total friction work (acc. Table 4, page 55)	
Q_a	[J]	friction work per acceleration	
Q_E	[J]	perm. friction work for single switching	Table 4, page 55
Q_v	[J]	friction work per deceleration	Table 4, page 55
t_S	[sec]	delay times	
Z		number of switchings until wear limit	

Calculation example

Data:

Input power	P_A	= 0.75 kW
Input speed	n	= 1400 rpm
Load torque output	M_L	= 3.0 Nm
Additional mass moment of inertia	$I_{zus.}$	= 0.0042 kgm²
3000 switchings per hour		

Drive torque

$$M_A = \frac{9550 \times P_A}{n} = \frac{9550 \times 0.75}{1400} = \mathbf{5.1} \text{ [Nm]}$$

Required torque

$$M_{erf.} = K \times M_A = 2 \times 5.1 = \mathbf{10.2} \text{ [Nm]}$$

Determined unit size acc. diagram 1 = Size 4

$$M_S \geq M_{erf.} = \mathbf{11} \text{ [Nm]}$$

Mass moment of inertia

$$I = I_{eig.} + I_{zus.} = 0.000637 + 0.0042 = \mathbf{0.00484} \text{ [kgm}^2\text{]}$$

Acceleration time input side (lift load) ($M_A \geq M_S$)

$$t_a = \frac{I \times n}{9.55 \times (M_S \overset{(+)}{-} M_L)} + {}^*t_1{}^{1)} \text{ (clutch)}$$

$$t_a = \frac{0.00484 \times 1400}{9.55 \times (11 - 3)} + 0.065 = \mathbf{0.153} \text{ [sec]}$$

Deceleration time output side (lower load)

$$t_v = \frac{I \times n}{9.55 \times (M_S \overset{+}{(-)} M_L)} + {}^*t_1{}^{2)} \text{ (brake)}$$

$$t_v = \frac{0.00484 \times 1400}{9.55 \times (11 - 3)} + 0.040 = \mathbf{0.129} \text{ [sec]}$$

* Switching times t_1 [1)] und t_1 [2)] from Table 3, page 55 = without overexcitation

Max. switching frequency per hour

$$S_{h\,max} = \frac{1}{(t_v + t_a) \times 1.2} \times 3600$$

$$S_{h\,max} = \frac{1}{(0.129 + 0.153) \times 1.2} \times 3600 = \mathbf{10.638} \text{ [h}^{-1}\text{]}$$

Friction work per acceleration

$$Q_a = \frac{I \times n^2}{182.4} \times \frac{M_S}{M_S - M_L}$$

$$Q_a = \frac{0.00484 \times 1400^2}{182.4} \times \frac{11}{11 - 3} = \mathbf{71.5} \text{ [J]} \leq Q_E$$

Friction work per deceleration

$$Q_v = \frac{I \times n^2}{182.4} \times \frac{M_S}{M_S + M_L}$$

$$Q_v = \frac{0.00484 \times 1400^2}{182.4} \times \frac{11}{11 + 3} = \mathbf{40.9} \text{ [J]} \leq Q_E$$

Check the selected unit size in the friction power diagram (determine point of intersection Q_a or Q_v to S_h).
(The point of intersection determined in diagram 2 must be located in or under the characteristic curve of the selected unit).

Number of switchings until wear limit

$$Z = \frac{Q_{ges.}}{Q_a \times 2} = \frac{44 \times 10^7}{71.5 \times 2} = \mathbf{3.08 \times 10^6} \text{ switchings}$$

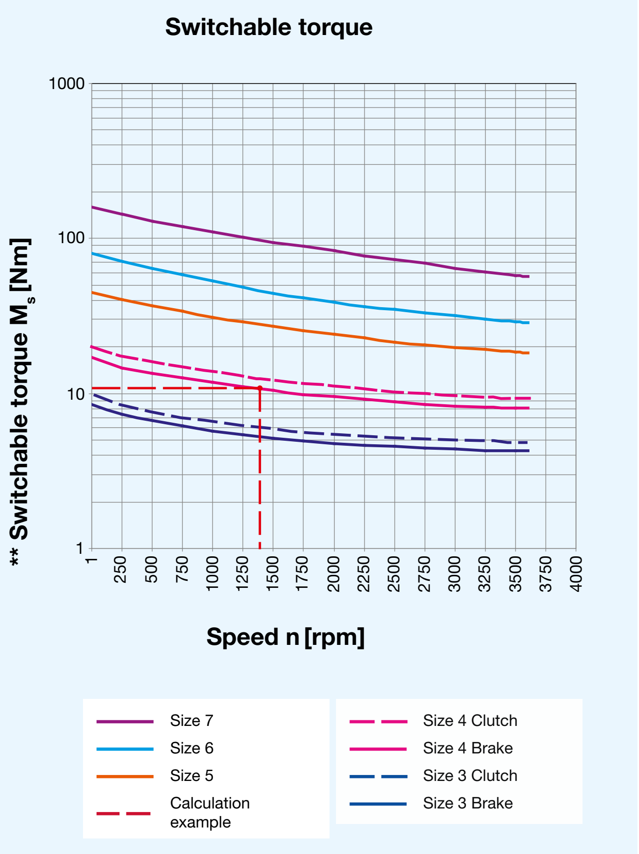


Diagram 1 ** Friction surfaces have been run in

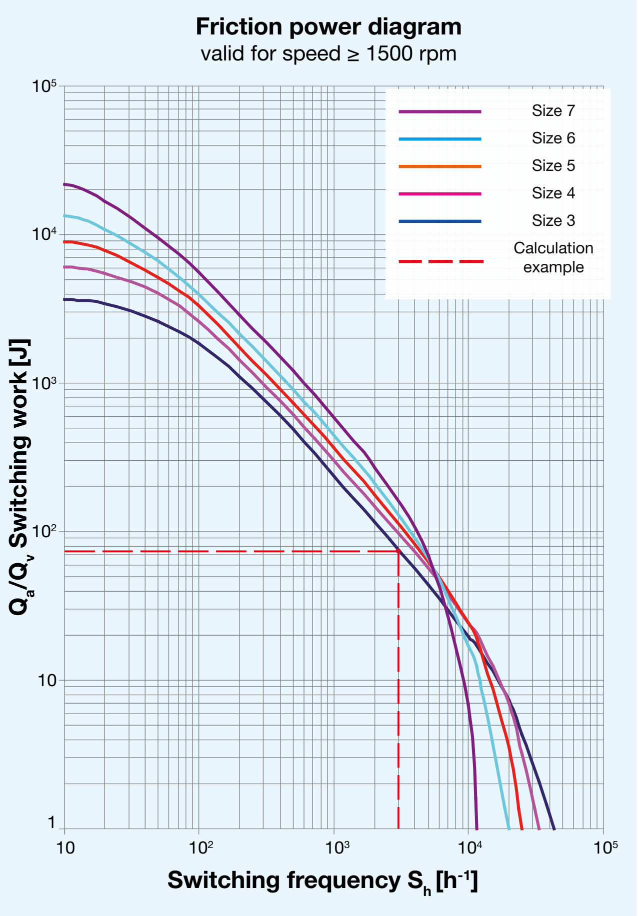


Diagram 2

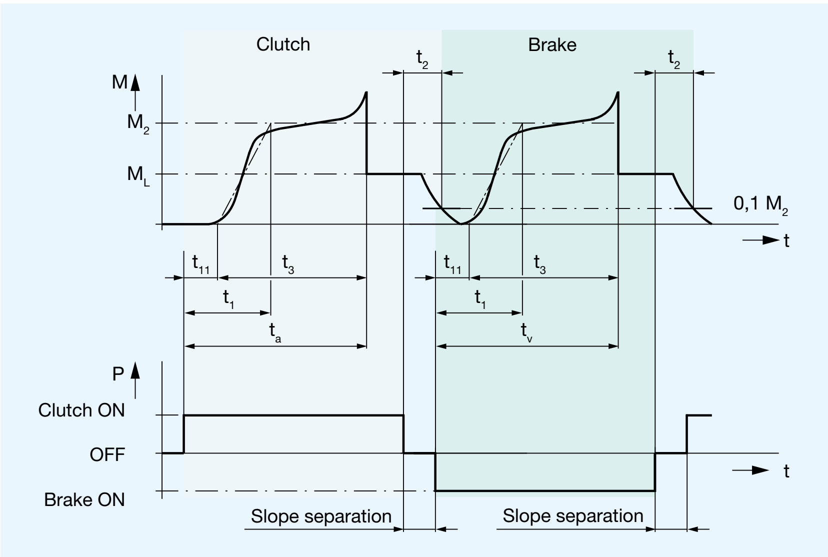
Switching times

The switching times stated in Table 3 have been determined by comprehensive series of tests. They are valid for switching DC-side with nominal air gap and warm coil.Deviations depend on the respective installation situation, ambient temperatures, release path and the type of rectification with which the corresponding clutch is operated.

Switching times				Size 3	Size 4	Size 5	Size 6	Size 7
without overexcitation	t_{11}	Clutch	[sec]	0.010	0.015	0.020	0.030	0.045
	t_1	Clutch	[sec]	0.045	0.065	0.080	0.150	0.200
	t_{11}	Brake	[sec]	0.006	0.008	0.010	0.015	0.025
	t_1	Brake	[sec]	0.035	0.040	0.055	0.100	0.150
	t_2	Clutch	[sec]	0.012	0.020	0.045	0.060	0.090
	t_2	Brake	[sec]	0.010	0.018	0.030	0.060	0.090
with overexcitation (only switch-on time)	t_{11}	Clutch	[sec]	0.003	0.005	0.007	0.010	0.015
	t_1	Clutch	[sec]	0.025	0.035	0.040	0.075	0.100
	t_{11}	Brake	[sec]	0.002	0.003	0.004	0.006	0.008
	t_1	Brake	[sec]	0.020	0.022	0.030	0.050	0.075
Recommended duration of overexcitation			[sec]	0.010[1)]	0.010[1)]	0.010	0.015	0.020
Minimal necessary slope separation	with overexcitation		[sec]	0.020	0.025	0.030	0.080	0.120
	without overexcitation		[sec]	0	0	0.015	0.050	0.080
Height of the overexcitation = approx. 10 x nominal voltage (current limited)								

Table 3

1) In case of operation with overexcitation and high switching frequency (80-100 % of the diagram value), the recommended period of the overexcitation acc. Table 3 must not be exceeded.



Key:

M_2 = Nominal torque of the brake or clutch
M_L = Load torque of the drive
P = Electrical power
t_a = Acceleration time
t_v = Deceleration time
t_1 = Connection time
t_{11} = Response delay on connection
t_2 = Separation time
t_3 = Slip time

Diagram 3: Torque-Time Diagram

Friction work			Size 3	Size 4	Size 5	Size 6	Size 7
Permitted friction work with a single switching	Q_E	[10^3 J]	3.8	6.2	9	15	25
Total friction work	Q_{ges}	[10^7 J]	22.5	44	87	171	340

Table 4

Please Observe!
Due to operating parameters such as sliding speed, pressing or temperature the **wear values** can **only be considered guideline values**.

your reliable partner

ROBA®-takt control unit Type 014.000.2

Function

The ROBA®-takt control unit operates according to the principle of a clocked switching regulator with a frequency of 18 kHz. Its coil is energised by actuating the sensor for clutch and brake. A temperature monitor protects the unit from overheating. Should the temperature exceed >80 °C, the coil voltage is switched off. The LED “excess temperature unit” lights up red. A slope separation avoids simultaneous occurrence of clutch and braking torques. On overexcitation, the coil attraction time is reduced, allowing exact switching and positioning.

Electrical connection

1	Coil connection for clutch	Br1 / Br2
2	Coil connection for brake	Ku1 / Ku2
3	Sensor connection for clutch	+12 V / Ku / Gnd1
4	Sensor connection for brake	+12 V / Br / Gnd2
5	Connection input voltage	PE, L1, N
6	Temperature monitoring	Option 1 (bare)
7	Signalling relay	Option 2 (bare)

Technical data

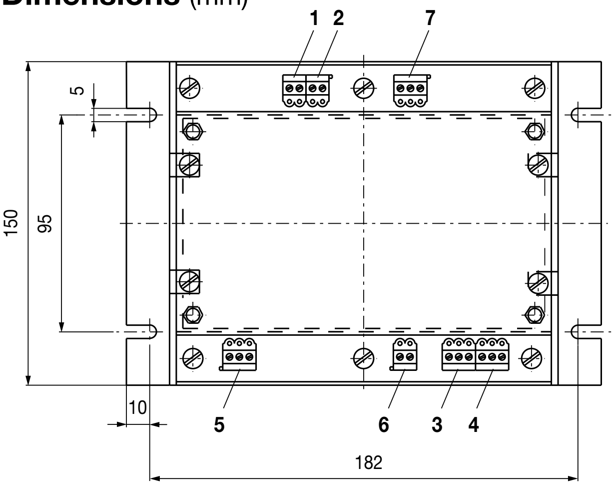
Input voltage	230 VAC ±10 %, 50 – 60 Hz
Current consumption	max. 4 Ampere /100 % duty cycle
No-load supply power	< 7 Watt
$Coil_{NENN}$ voltage	24 VDC
$Coil_{NENN}$ power	maximal 96 Watt
$Coil_{NENN}$ current	**Manufacturer-side** setting to *mayr*® ROBA®-takt size
Coil overexcitation	maximal 325 VDC Current limitation is adapted to the respective coil size.
Overexcitation time	2 – 50 ms (-30 % to +60 %), externally adjustable (only applicable with coding “overexcitation ON”)
Slope separation	2 – 150 ms (-25 % to +30 %), externally adjustable
Protection	IP20
Ambient temperature	0 °C to +50 °C
Storage temperature	-20 °C up to +70 °C
Max. conductor cross-section	2.5 mm²
Weight:	1.5 kg
Device fuses, input-side:	
G-microfuse	F1/F2, (M) 4 A, 5x20 mm
Device fuses, coil-side:	
G-microfuse	F3, the current is adapted to the ROBA®-takt sizes. Always use the same replacement fuses
Overvoltage category	two; one for connection to PELV/SELV (control cables)
Overvoltage protection	**For installation in overvoltage <u>category III,</u> a suitable overvoltage protection unit is required between the incoming voltage and the ROBA®-takt control unit.**

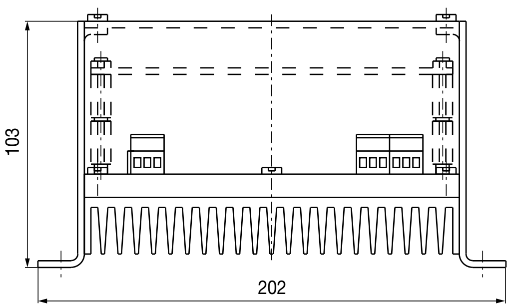
Control unit temperature monitoring
A fitted temperature switch prevents the control unit from overheating.

Application

This unit is used to start, stop and to position by switching and controlling the *mayr*® -ROBA®-takt clutch brake modules.

Dimensions (mm)





Order number

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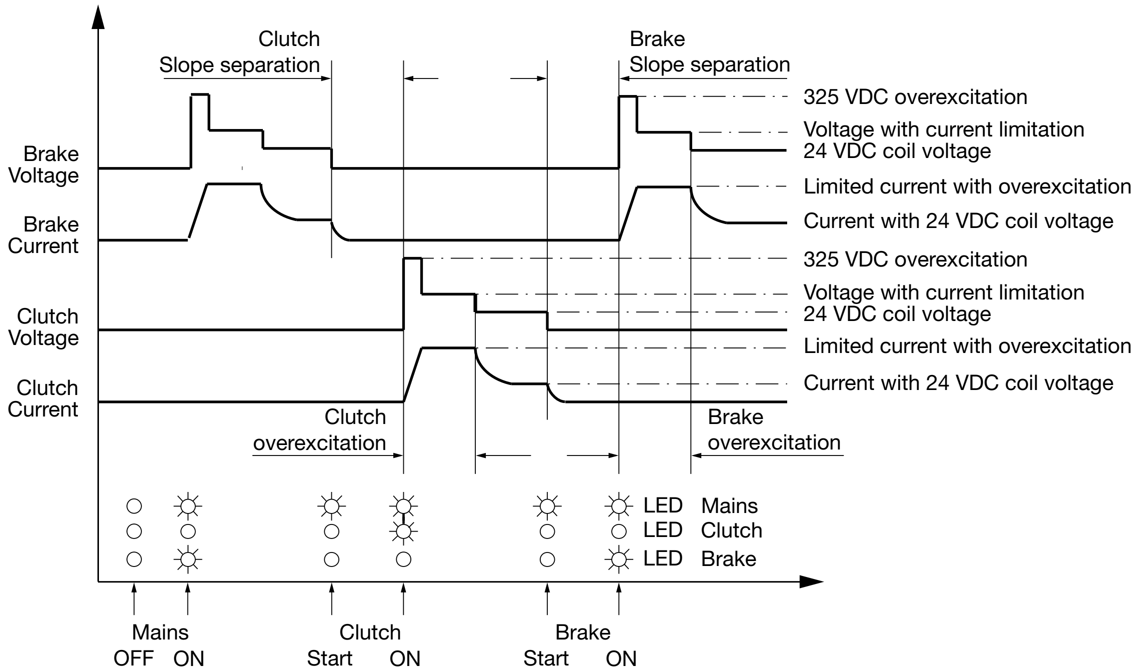
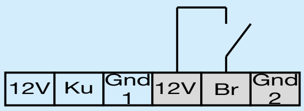
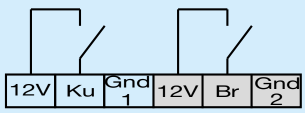
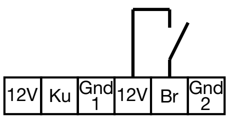
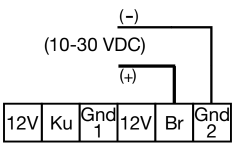
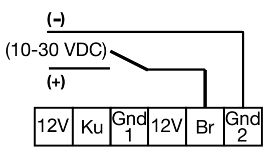
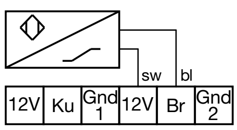
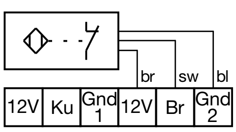
Sizes 3 – 7
ROBA®-takt control unit

Functional sequence



Wiring example Control elements / control function Control sensor for start and stop Brake = (Br) Clutch = (Ku)		**Wiring example** **1-sensor operation** 		**Wiring example** **2-sensor operation** 	
Application		Function (condition-controlled)		Function (slope-controlled)	
Contact potential-free (NO contact)		Close contact	Clutch ON	Close contact clutch **or**	Clutch ON
		Open contact	Brake ON	Close contact brake	Brake ON
PLC - Control (10 - 30 VDC)		+ 24 VDC signal	Clutch ON	+ 24 VDC signal to clutch **or**	Clutch ON
		0 VDC signal	Brake ON	+ 24 VDC signal to brake	Brake ON
External voltage (10 - 30 VDC)		+10 - 30 VDC signal	Clutch ON	+10 - 30 VDC signal to clutch **or**	Clutch ON
		0 VDC signal	Brake ON	+10 - 30 VDC signal to brake	Brake ON
NAMUR Proximity switch (10 - 30 VDC)		Sensor undamped	Clutch ON	Sensor clutch undamped **or**	Clutch ON
		Sensor damped	Brake ON	Sensor brake undamped	Brake ON
PNP - NC contact Proximity switch (10 - 30 VDC)		Sensor undamped	Clutch ON	Sensor clutch undamped **or**	Clutch ON
		Sensor damped	Brake ON	Sensor brake undamped	Brake ON

ROBA®-takt circuit module Type 004.000._

Application

This device is used to start and stop mayr® ROBA®-takt clutch brake modules.
It can be used for alternating 24 VDC coil switching, if a 24 VDC power supply is available.

Function

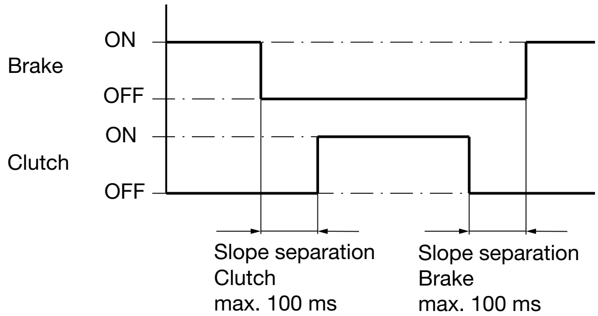
1-sensor operation:

activated	clutch is energised
deactivated	brake is energised

The respective control of the clutch or brake is indicated via LED.
The ROBA®-takt circuit module has no overexcitation function.

The brake has priority: The brake is energised independently of the sensor position when the 24 VDC power supply is switched on. The coil is energised with the 24 VDC power supply.

Slope separation: To avoid simultaneous clutch and braking torques, a slope separation of 0 – 100 ms between clutch and brake can be set, which acts according to the respective attraction time and drop-out time of the coils (see switching time table). This adjustment is carried out via the potentiometers Ku = clutch (P2) and Br = brake (P1). The factory default setting is 0 ms.



Electrical connection (Terminals)

1	Input voltage	24 VDC
2	Input voltage	GND
3 + 4	Brake	
5 + 6	Clutch	
7	Control voltage for switches or sensors	12 VDC
8 + 9	Control inputs	

Technical data

Input voltage	24 VDC **SELV/PELV** ripple content ≤ 5%
Recommended fuse	T 4A
Output voltage	24 VDC
Output power	maximal 79 W
Slope separation	0 – 100 ms (factory default setting is 0 ms)
Ambient temperature	0 °C to +70 °C
Storage temperature	-20 °C up to +85 °C
Conductor cross-section	0.14 – 1.5 mm² / AWG 26 - 14
Protection	IP00
Design	Printed board with screw-on attachment part or a mounting frame for 35 mm standard mounting rails

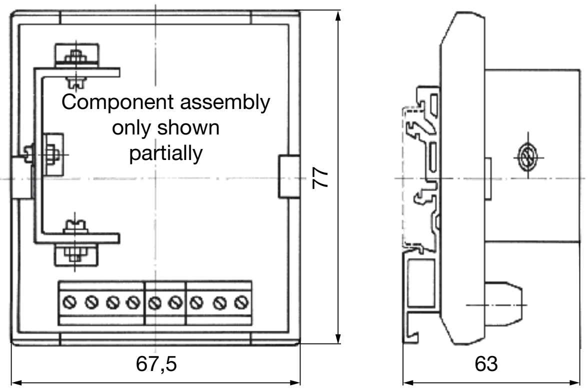
Maximal cycle frequency		45 °C	70 °C
up to 1 A / Sizes 3 + 4	cycles / min	600	600
approx. 2 A / Sizes 5 + 6	cycles / min	240	180
approx. 3 A / Size 7	cycles / min	120	75

Attention!

Higher cycle frequencies will lead to ROBA®-takt circuit module overload and failure.

Dimensions (mm)

Dimensions with mounting frame



Order number

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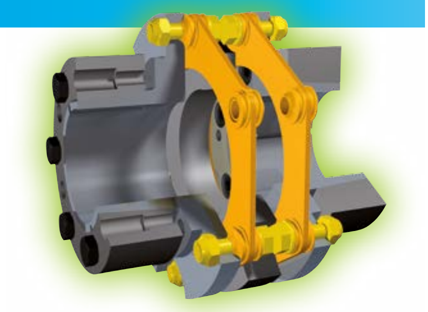
Size 1	only printed board without frame	0
	printed board with mounting frame	1

Product Summary

Safety Clutches/Overload Clutches

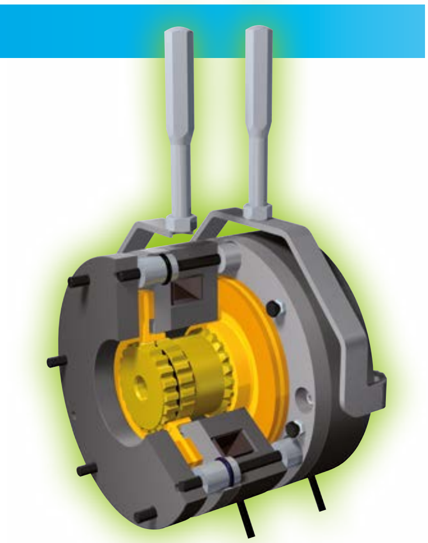
- EAS®-Compact®/EAS®-NC
  Positive locking and completely backlash-free torque limiting clutches
- EAS®-smartic®
  Cost-effective torque limiting clutches, quick installation
- EAS®-element clutch/EAS®-elements
  Load-disconnecting protection against high torques
- EAS®-axial
  Exact limitation of tensile and compressive forces
- EAS®-Sp/EAS®-Sm/EAS®-Zr
  Load-disconnecting torque limiting clutches with switching function
- ROBA®-slip hub
  Load-holding, frictionally locked torque limiting clutches
- ROBA®-contitorque
  Magnetic continuous slip clutches
- EAS®-HSC/EAS®-HSE
  High-speed safety clutches for high-speed applications

Shaft Couplings



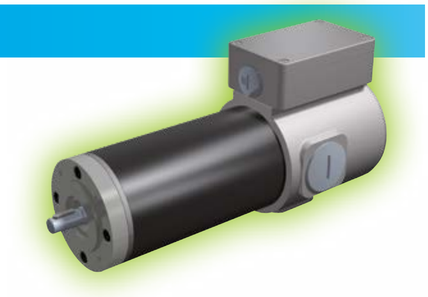
- smartflex®/primeflex®
  Perfect precision couplings for servo and stepping motors
- ROBA®-ES
  Backlash-free and damping for vibration-sensitive drives
- ROBA®-DS/ROBA®-D
  Backlash-free, torsionally rigid all-steel couplings
- ROBA®-DSM
  Cost-effective torque-measuring couplings

Electromagnetic Brakes/Clutches



- ROBA-stop® standard
  Multifunctional all-round safety brakes
- ROBA-stop®-M motor brakes
  Robust, cost-effective motor brakes
- ROBA-stop®-S
  Water-proof, robust monoblock brakes
- ROBA-stop®-Z/ROBA-stop®-silenzio®
  Doubly safe elevator brakes
- ROBA®-diskstop®
  Compact, very quiet disk brakes
- ROBA®-topstop®
  Brake systems for gravity loaded axes
- ROBA®-linearstop
  Backlash-free brake systems for linear motor axes
- ROBA®-guidestop
  Backlash-free holding brake for profiled rail guides
- ROBATIC®/ROBA®-quick/ROBA®-takt
  Electromagnetic clutches and brakes, clutch brake units

DC Drives



- tendo®-PM
  Permanent magnet-excited DC motors