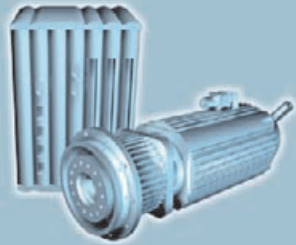




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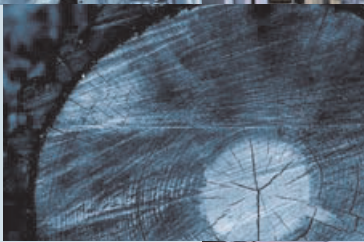
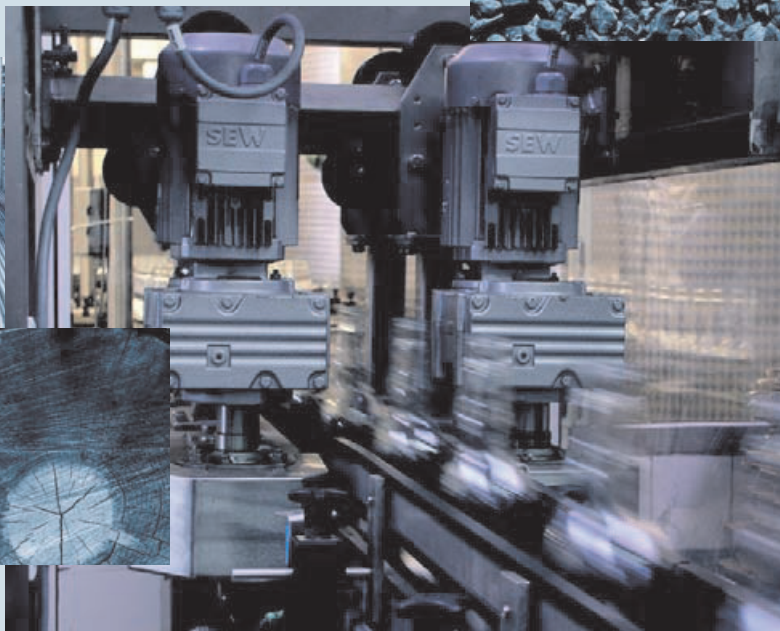
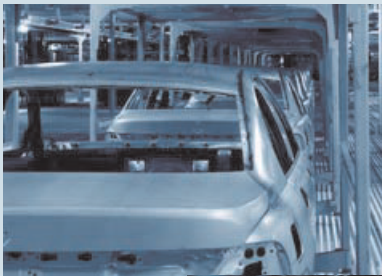
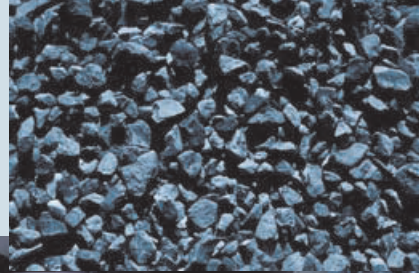


SEW Disc Brakes

KA200000

Edition 06/2006
11354615 / EN

Drive Engineering -
Practical Implementation





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1 Important Notes

1.1 Explanation of symbols



Important notes
for safe and fault-free operation.



Tips and useful information.



Reference to other SEW publications.



Reference to SEW software



Do not start up the unit until you have established that the machine complies with the EMC Directive 89/336/EEC and that the conformity of the end product has been determined in accordance with the Machinery Directive 89/392/EEC (with reference to EN 60204).



2 Introduction

2.1 Introduction

This documentation is designed for project planning engineers who intend to install AC motors, servomotors or geared brake motors from SEW-EURODRIVE. It provides information on the basic principles, special characteristics, intended use and electrical connection of SEW brake motors, and also includes sample circuits.

Note that this documentation does not deal with the various safety conditions arising in specific cases, nor with how they can be implemented in the motor control. Project planning engineers are responsible for these aspects of the system.



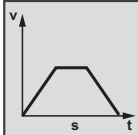
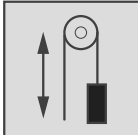

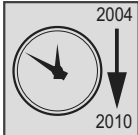
The working principle and characteristic data of SEW disc brakes are also described in the SEW catalogs dealing with AC gearmotors, brake motors, geared servomotors and variable speed gearmotors. Refer to the SEW publication 'Drive Engineering - Practical Implementation, Volume 1' for details on the dimensioning principles. All other information relating to drive calculations can also be found in this documentation. You can use the SEW project planning software 'PRODRIVE' to assist you with project planning.



For information on startup, operation and maintenance, refer to the relevant operating instructions.

2.2 Braking tasks and how to solve them


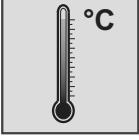
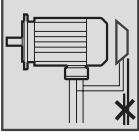
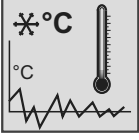
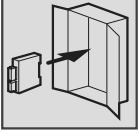
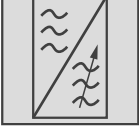

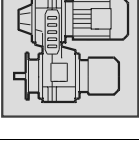
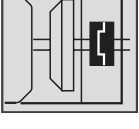
The SEW brake system, just like the entire product range of SEW-EURODRIVE, has a modular structure. A characteristic solution is offered for all standard tasks through the appropriate combination of mechanical and electronic components of the brake system. The table below provides an overview of the typical properties and refers you to useful notes in the relevant sections.

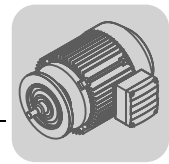
	Tasks / application conditions	Additional information		
	Positioning	Pages 9-12	Page 32	
	Hoist operation	Pages 9-12	Page 32	
	High starting frequency	Pages 9-12	Page 31	
	Long brake service life	Pages 9-12	Page 31	



Introduction

Braking tasks and how to solve them

	Tasks / application conditions	Additional information		
	<p style="text-align: center;">Low noise level</p>	<p>Pages 9-13</p>		
	<p style="text-align: center;">High ambient temperature / restricted ventilation</p>	<p>Pages 9-12</p>	<p>Page 35</p>	
	<p style="text-align: center;">Avoiding brake cables</p>	<p>Page 18</p>	<p>Page 33</p>	<p>Page 34</p>
	<p style="text-align: center;">Low and fluctuating ambient temperatures</p>	<p>Pages 9-12</p>	<p>Page 35</p>	
	<p style="text-align: center;">Brake control system in the control cabinet</p>	<p>Page 20</p>	<p>Page 35</p>	
	<p style="text-align: center;">Electronically-controlled drives with mechanical brake</p>	<p>Pages 37-38</p>		
	<p style="text-align: center;">Explosion-proof brake motor</p>	<p>Pages 40-41</p>		
	<p style="text-align: center;">Variable speed gear unit with brake</p>	<p>Page 42</p>		
	<p style="text-align: center;">Centrifugal coupling with brake</p>	<p>Page 43</p>		



2.3 Principles of the SEW brake

2.3.1 Basic structure

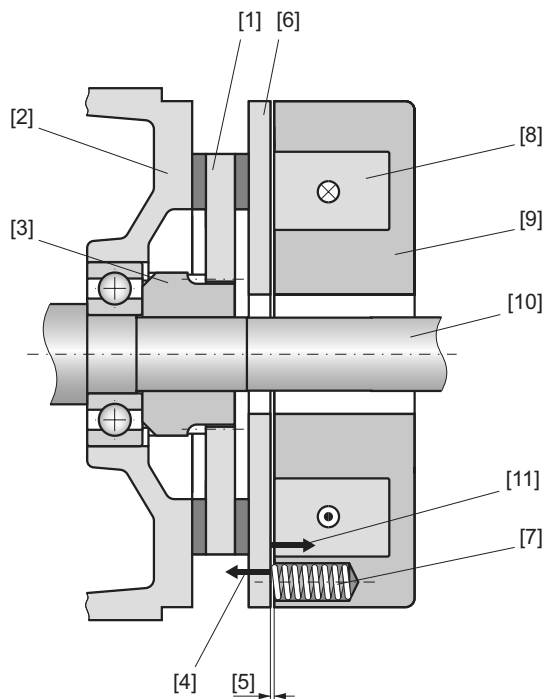
The SEW brake is an electromagnetic disc brake with a DC coil that is released electrically and braked using spring force. The system meets all fundamental safety requirements: The brake is applied automatically if the power fails.

The principal parts of the brake system are the brake coil itself [8] (accelerator coil + coil section = holding coil), comprising the brake coil body [9] with an encapsulated winding and a tap, the moving pressure plate [6], the brake springs [7], the brake disc [1] and the brake endshield [2].

A characteristic feature of SEW brakes is their very short length: The brake endshield is a part of both the motor and the brake. The integrated design of the SEW brake motor makes for particularly compact and sturdy solutions.

2.3.2 Basic functions

In contrast to other disc brakes with a DC coil, the SEW brakes operate with a two coil system. The pressure plate is forced against the brake disc by the brake springs when the electromagnet is deenergized. The motor is slowed down. The type and number of brake springs determines the braking torque. When the brake coil is connected to the appropriate DC voltage, the spring force [4] is overcome by magnetic force [11], thereby bringing the pressure plate into contact with the brake coil body. The brake disc moves clear and the rotor can turn.



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- | | |
|---------------------|----------------------------|
| [1] Brake disc | [7] Brake spring |
| [2] Brake endshield | [8] Brake coil |
| [3] Driver | [9] Brake coil body |
| [4] Spring force | [10] Motor shaft |
| [5] Working air gap | [11] Electromagnetic force |
| [6] Pressure plate | |

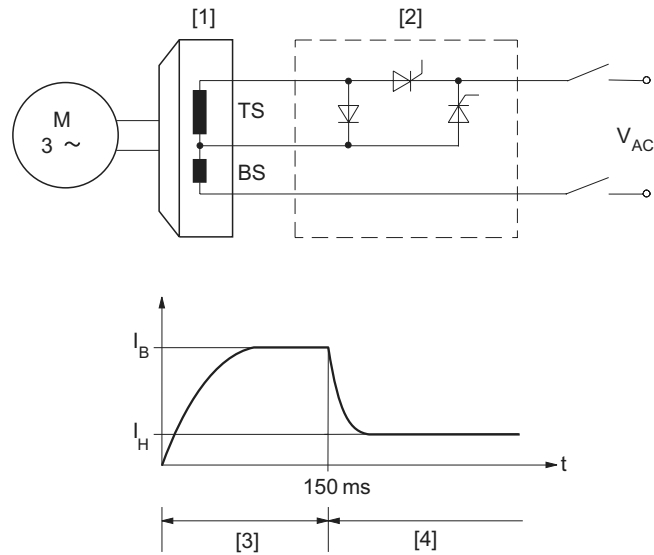


Introduction

Principles of the SEW brake

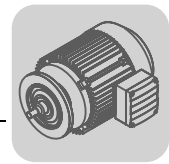
Particularly short response times at switch-on

A special brake control system ensures that only the accelerator coil is switched on first, followed by the holding coil (entire coil). The powerful impulse magnetization (high acceleration current) of the accelerator coil results in a very short response time, particularly in large brakes, without reaching the saturation limit. The brake disc moves clear very quickly and the motor starts up with hardly any braking losses.

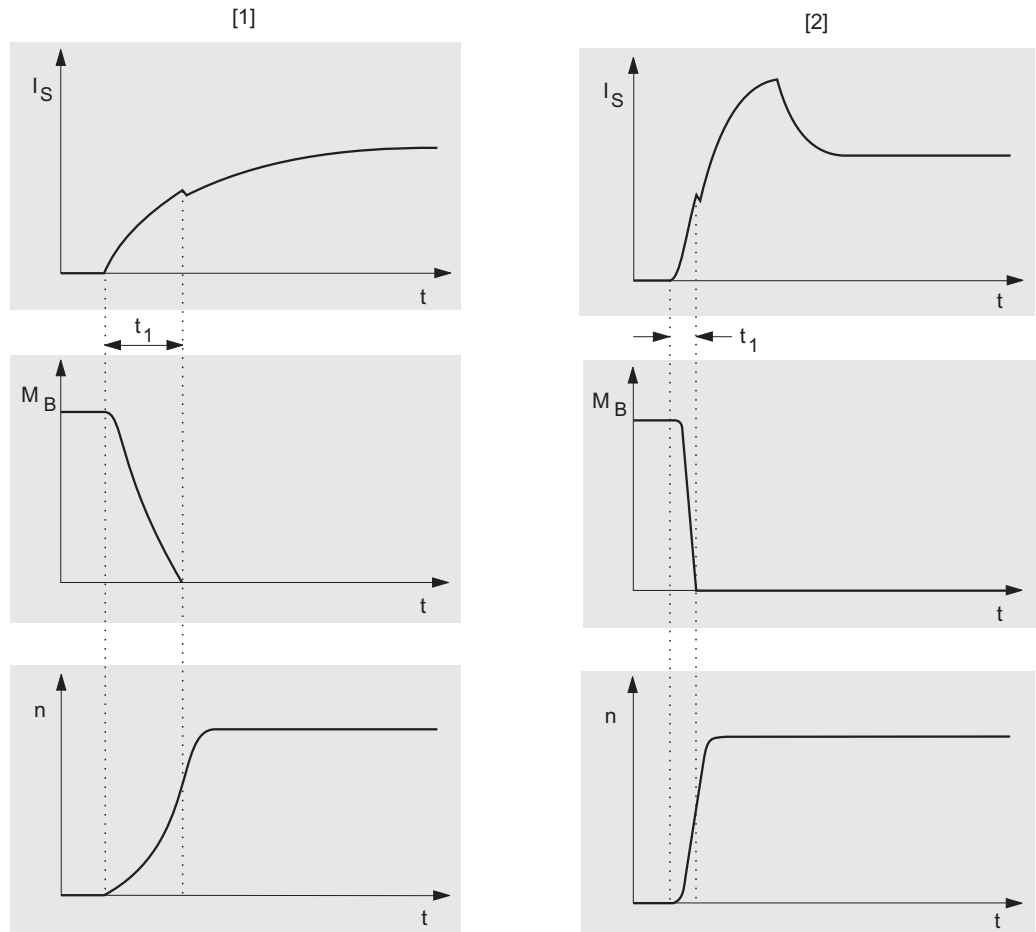


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- BS Accelerator coil
- TS Coil section
- [1] Brake
- [2] Brake control system
- [3] Acceleration
- [4] Holding
- I_B Acceleration current
- I_H Holding current
- BS + TS = Holding coil



The particularly short response times of SEW brakes lead to faster motor startup time and minimum start-up heating, which reduces energy consumption and brake wear during startup (see following figure). Benefits for the user: very high starting frequency and a long brake service life.



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- [1] Switch-on procedure for operation with rectifier without switching electronics
- [2] Switch-on procedure for operation with SEW rectifier with switching electronics, e.g. BGE (standard from size 112)

I_S Coil current
 M_B Braking torque
 n Speed
 t_1 Brake response time

The system switches to the holding coil electronically as soon as the SEW brake has released. The braking magnet is now only magnetized to such an extent (weak holding current) to ensure that the pressure plate is held open with a sufficient degree of safety and minimum brake heating.

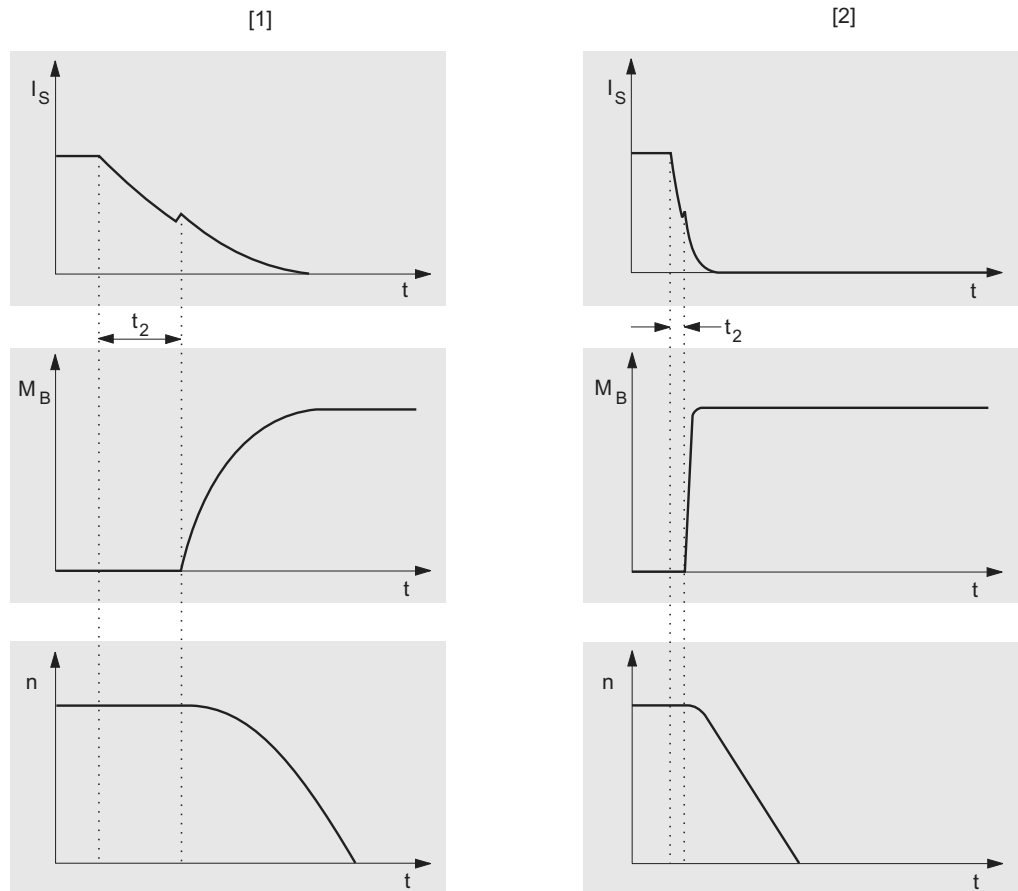


Introduction

Principles of the SEW brake

Particularly short response time at switch-off

This means de-excitation occurs very rapidly when the coil is switched off, so the brake is applied with a very fast response time, particularly with large brakes. User benefits: Very short braking distance with high repeat accuracy and a high degree of safety, e.g. for applications involving hoist drives.



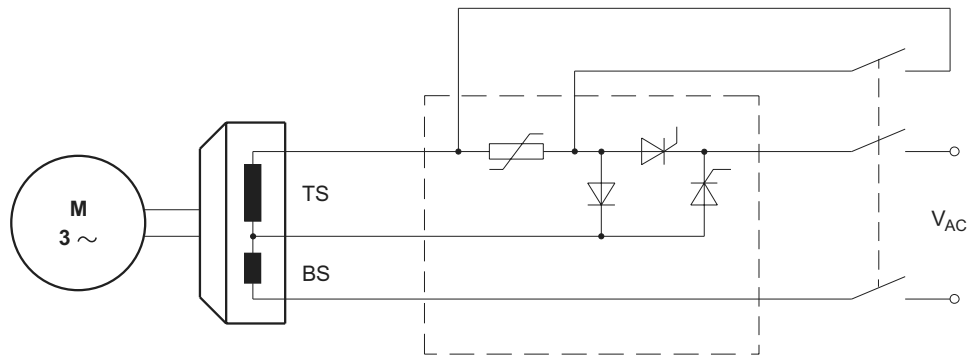
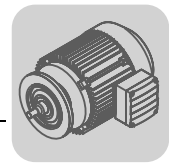
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- I_S Coil current
- M_B Braking torque
- n Speed
- t_2 Brake application time
- [1] Brake response to cut-off in the AC circuit
- [2] Brake response to cut-off in the AC and DC circuits

The response time for the application of the brake also depends on how rapidly the energy stored in the brake coil is dissipated when the power supply is switched off. A free-wheeling diode is used to dissipate the energy for a cut-off in the AC circuit. The current decays according to an e-function.

The current dissipates much more rapidly via a varistor when the DC and AC circuits are cut-off at the same time as the coil's DC circuit. The response time is significantly shorter. Conventionally, cut-off in the DC and AC circuits is implemented using an additional contact on the brake contactor (suitable for an inductive load).

Under certain circumstances, it is a good idea to use SR and UR electronic relays (see section Cut-off in the DC and AC circuits with electronic relay) for interrupting the DC circuit.



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Particularly quiet Particularly quiet brake motors are required in many applications in the power range up to approximately 5.5 kW (4-pole) to reduce noise pollution. SEW-EURODRIVE implements special design measures to meet these requirements as standard for all AC brake motors up to size 132S without affecting the special dynamic features of the brake system.

Particularly safe Tried and tested design components and brake controls tested in trial applications ensure that the SEW brake has a high degree of operational safety.



Introduction

Details of the SEW brake system

2.4 Details of the SEW brake system

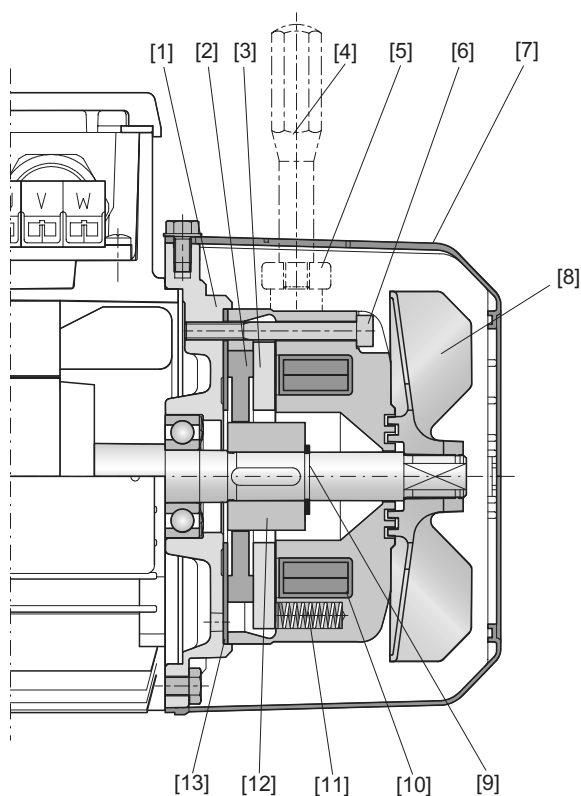
2.4.1 Brake BMG02

The BMG02 brake is used in AC brake motors of size DT56.

The BMG02 brake is only available as a complete spare part.

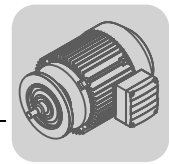
Main features of the brake:

- Brake coil with tap
- Preassembled unit
- Movable pressure plate
- Plug connector (contact box) for simple electrical contacting
- The number of brake springs determines the braking torque



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- | | |
|---------------------------|---------------------|
| [1] Brake endshield | [8] Fan |
| [2] Brake disc (complete) | [9] Circlip |
| [3] Pressure plate | [10] Brake coil |
| [4] Hand lever | [11] Brake spring |
| [5] Release lever | [12] Driver |
| [6] Retaining screw | [13] Friction plate |
| [7] Fan guard | |

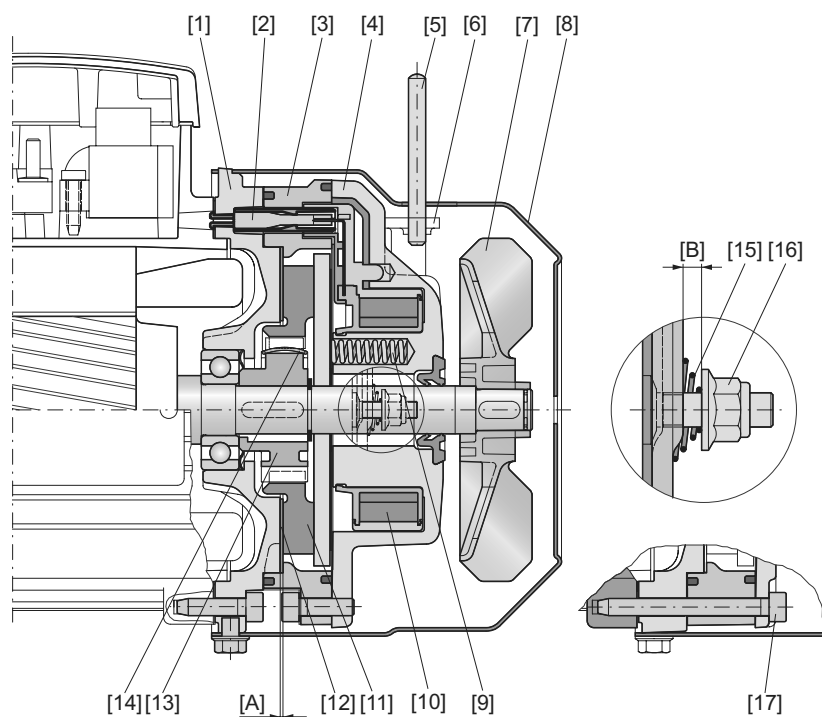


2.4.2 Brake BR03

The BR03 brake is used in AC brake motors of size DR63. The BR brake can be installed mechanically or electrically and is then ready for operation. The BR03 brake is only available as a complete spare part. The guide ring [3] allows for a very compact design.

Main features of the brake:

- Brake coil with tap
- Movable pressure plate
- Plug connector (contact box) for simple electrical contacting
- The number of brake springs determines the braking torque



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- | | |
|---------------------|--|
| [1] Brake endshield | [10] Brake coil |
| [2] Contact box | [11] Brake disc |
| [3] Guide ring | [12] Friction plate |
| [4] Magnet | [13] Driver |
| [5] Hand lever | [14] Clasp |
| [6] Release lever | [15] Conical coil spring |
| [7] Fan | [16] Hex nut |
| [8] Fan guard | [17] Retaining screws |
| [9] Brake spring | [A] Working air gap |
| | [B] Floating clearance of the manual brake release |



Introduction

Details of the SEW brake system

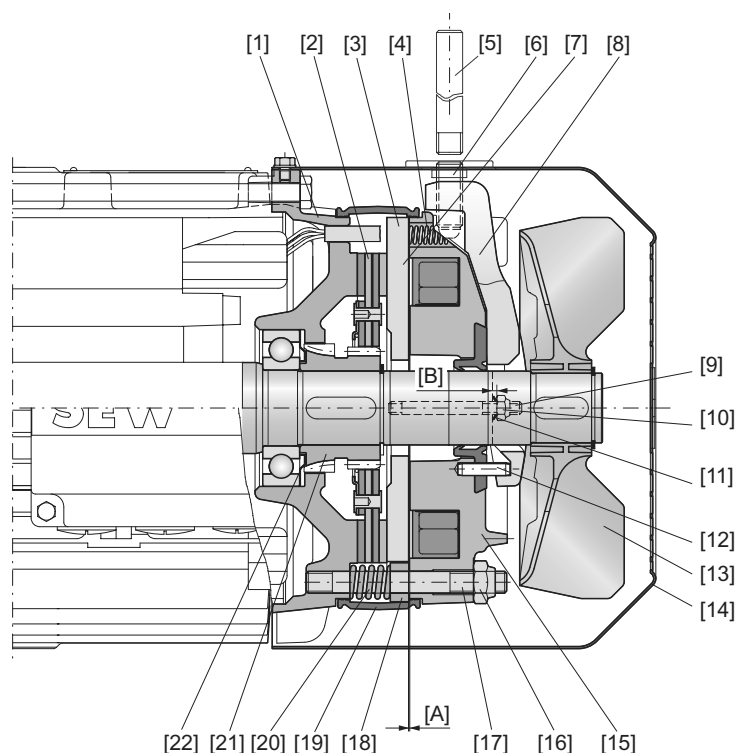
2.4.3 BM(G) brake

The BM(G) brake is installed in all AC brake motors DT71 - DV280, in extended housings with centrifugal couplings and in VARIBLOC® variable speed gear units.

Main features of the brake:

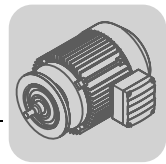
- Brake coil with tap
- Movable pressure plate
- Brake disc - for motor sizes 180 to 280, also available as double disc brake
- The number of brake springs determines the braking torque
- Brake endshield

The working air gap [A] is set using the 3 retaining screws and the nuts (see section 12.10 in the "Technical Data")



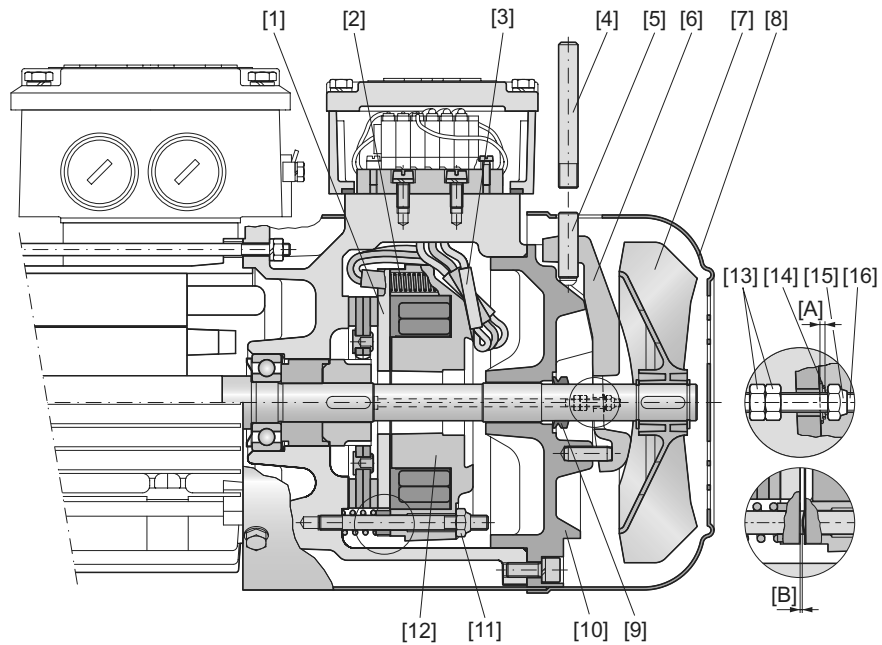
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- | | |
|---|--|
| [1] Brake endshield | [13] Fan |
| [2] Brake disc complete | [14] Fan guard |
| [3] Pressure plate | [15] Magnet complete |
| [4] Brake spring | [16] Hex nut |
| [5] Hand lever (with non-locking HR manual brake release) | [17] Stud |
| [6] Setscrew | [18] Pressure ring |
| [7] Damping plate (only with BMG brakes) | [19] Rubber sealing collar |
| [8] Release lever | [20] Counter spring |
| [9] Stud | [21] Driver |
| [10] Adjusting screw | [22] Equalizing ring |
| [11] Conical coil spring | [A] Working air gap |
| [12] Dowel pin | [B] Floating clearance of the manual brake release |



2.4.4 Brake BC

The BC brake is installed in explosion-proof AC motors eDT..BC. It is a flameproof brake with protection type EEx d IIB T3. The brake comprises the same basic elements as the BMG brake and is integrated in the motors eDT71..BC - eDT100..BC (see section 7). The working air gap is adjusted as for BMG (see section 12.10 in Technical Data).



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- | | |
|--------------------|--|
| [1] Pressure plate | [10] Housing cover |
| [2] Brake spring | [11] Hex nut |
| [3] Cable | [12] Brake coil body |
| [4] Hand lever | [13] Hex nut |
| [5] Setscrew | [14] Conical coil spring |
| [6] Release lever | [15] Setting nut |
| [7] Fan | [16] Holding bolt or stud |
| [8] Fan guard | [A] Floating clearance of the manual brake release |
| [9] Gasket | [B] Working air gap |



Introduction

Details of the SEW brake system

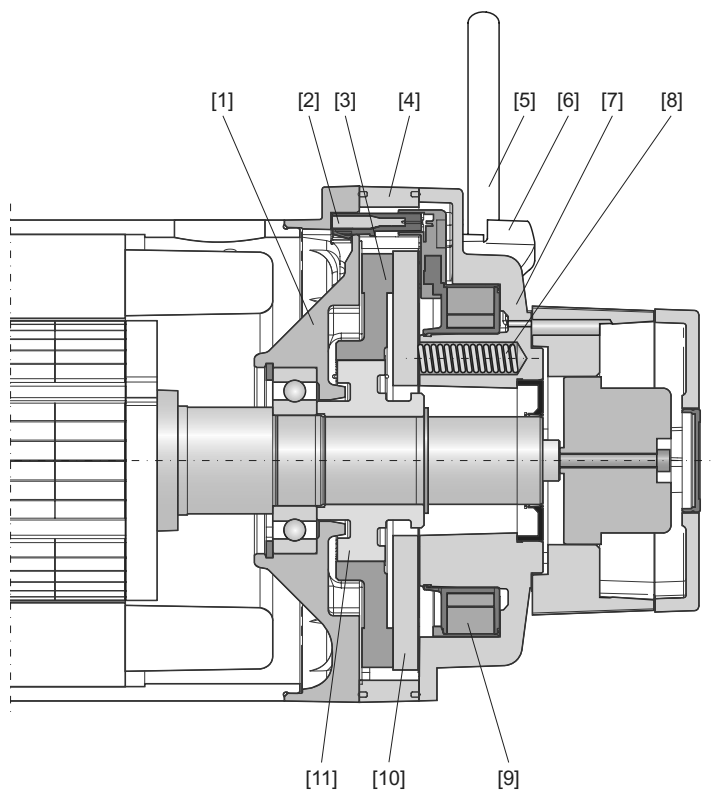
2.4.5 BR brake

The BR brake is installed in synchronous servomotors CM...BR and ASEPTIC motors DAS...BR. The SEW brakes transfer the braking torque to two friction surfaces. The brake is released when the brake coil is energized with DC current. As a result, the pressure plate [10] is pulled onto the brake coil body. The brake disk [3] which is connected to the motor shaft by a driver [11] is released. When the brake coil is deenergized, the brake springs [8] determine the braking torque generated between the brake disc and the brake endshield [1] or pressure plate.

The BR brake is only available as a complete spare part.

Main features of the brake:

- Brake coil with tap
- Movable pressure plate
- Plug connector (contact box) for simple electrical contacting
- The number of brake springs determines the braking torque



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- | | |
|---|---------------------|
| [1] Brake endshield | [7] Magnet |
| [2] Contact box | [8] Brake spring |
| [3] Brake disc | [9] Brake coil |
| [4] Guide ring | [10] Pressure plate |
| [5] Hand lever | [11] Driver |
| [6] Release lever (not installed in ASEPTIC motors) | |



2.4.6 Brake control system

Various brake control systems are available for controlling disc brakes with a DC coil, depending on the requirements and the operating conditions. All brake control systems are fitted as standard with varistors to protect against overvoltage.

The brake control systems are either installed directly on the motor in the wiring space or in the control cabinet. For motors of thermal class 180 (H) and explosion-proof motors (eDT..BC), the control system must be installed in the control cabinet.

Standard version

As standard, DT/DV...BM(G) AC brake motors are delivered with installed brake control system BG/BGE for AC connection or an installed control unit BS/BSG for DC 24 V connection. The motors are delivered completely ready for connection.

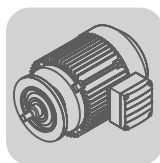
Motor type	AC connection	DC 24 V connection
DT56..BMG	BG	No control unit ¹⁾
DR63..BR		
DT71..BMG		BS
DT80..BMG		
DT90..BMG		
DV100..BMG		
DV112..BMG		
DV132S..BMG	BGE	BSG
DV132M..BM		
DV132ML..BM		
DV160..BM		
DV180..BM		
DV200..BM		
DV225..BM		
DV250..BMG		
DV280..BMG		

1) The overvoltage protection must be implemented by the customer, for example using varistors.

Brake control system in the wiring space

The supply voltage for brakes with an AC connection is either supplied separately or taken from the supply system of the motor in the wiring space. Only motors with a fixed speed can be supplied from the motor supply voltage. With pole-changing motors and for operation with a frequency inverter, the supply voltage for the brake must be supplied separately.

Furthermore, bear in mind that the brake response is delayed by the residual voltage of the motor if the brake is powered by the motor supply voltage. The brake application time t_2 specified in the technical data for cut-off in the AC circuit applies to a separate supply only.



Introduction

Details of the SEW brake system

Motor wiring space

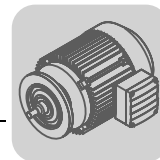
The following table lists the technical data of brake control systems for installation in the motor wiring space and the assignments with regard to motor size and connection technology. The different housings have different colors (= color code) to make them easier to distinguish.

Type	Function	Voltage	Holding current I_{Hmax} [A]	Type	Part number	Color code
BG	One-way rectifier	AC 90...0.500 V	1.2	BG 1.2	826 992 0	Black
		AC 24...500 V	2.4	BG 2.4	827 019 8	brown
		AC 150...500 V	1.5	BG 1.5	825 384 6	Black
		AC 24...500 V	3.0	BG 3	825 386 2	brown
BGE	One-way rectifier with electronic switching	AC 150...0.500 V	1.5	BGE 1.5	825 385 4	Red
		AC 42...0.150 V	3.0	BGE 3	825 387 0	Blue
BSR	One-way rectifier + current relay for cut-off in the DC circuit	AC 90...500 V	1.0	BG1.2 + SR 11	826 992 0 + 826 761 8	
		AC 42...0.87 V	1.0	BG2.4 + SR 11	827 019 8 + 826 761 8	
		AC 150...500 V	1.0	BGE 1.5 + SR 11	825 385 4 + 826 761 8	
			1.0	BGE 1.5 + SR 15	825 385 4 + 826 762 6	
			1.0	BGE 1.5 + SR 19	825 385 4 + 826 246 2	
		AC 42...0.150 V	1.0	BGE 3 + SR11	825 387 0 + 826 761 8	
			1.0	BGE 3 + SR15	825 387 0 + 826 762 6	
			1.0	BGE 3 + SR19	825 387 0 + 826 246 2	
BUR	One-way rectifier + voltage relay for cut-off in the DC circuit	AC 90...0.150 V	1.0	BG 1.2 + UR 11	826 992 0 + 826 758 8	
		AC 42...0.87 V	1.0	BG 2.4 + UR 11	827 019 8 + 826 758 8	
		AC 150...500 V	1.0	BG 1.2 + UR 15	826 992 0 + 826 759 6	
		AC 150...500 V	1.0	BGE 1.5 + UR 15	825 385 4 + 826 759 6	
		AC 42...0.150 V	1.0	BGE 3 + UR 11	825 387 0 + 826 758 8	
BS	Varistor protection circuit	DC 24 V	5.0	BS24	826 763 4	Aqua
BSG	Electronic switching	DC 24 V	5.0	BSG	825 459 1	White

Control cabinet

The following table lists the technical data of brake control systems for installation in the control cabinet and the assignments with regard to motor size and connection technology. The different housings have different colors (= color code) to make them easier to distinguish.

Type	Function	Voltage	Holding current I_{Hmax} [A]	Type	Part number	Color code
BMS	One-way rectifier as BG	AC 150...500 V	1.5	BMS 1.5	825 802 3	Black
		AC 42...0.150 V	3.0	BMS 3	825 803 1	brown
BME	One-way rectifier with electronic switching as BGE	AC 150...500 V	1.5	BME 1.5	825 722 1	Red
		AC 42...0.150 V	3.0	BME 3	825,723 X	Blue
BMH	One-way rectifier with electronic switching and heating function	AC 150...500 V	1.5	BMH 1.5	825,818 X	green
		AC 42...0.150 V	3	BMH 3	825 819 8	Yellow
BMP	One-way rectifier with electronic switching, integrated voltage relay for cut-off in the DC circuit	AC 150...500 V	1.5	BMP 1.5	825 685 3	White
		AC 42...0.150 V	3.0	BMP 3	826 566 6	Light blue
BMK	One-way rectifier with electronic switching, DC 24 V control input and cut-off in the DC circuit	AC 150...500 V	1.5	BMK 1.5	826 463 5	Aqua
		AC 42...0.150 V	3.0	BMK 3	826 567 4	Bright red
BMV	Brake control unit with electronic switching, DC 24 V control input and fast cut-off	DC 24 V	5.0	BMV	13000063	White



2.5 *Project planning information*

The size of the brake motor and its electrical connection must be selected carefully to ensure the longest possible service life.

The following aspects must be taken into account:

- Selection of the brake and braking torque in accordance with the project planning data (motor selection)
- Determining the brake voltage
- Selection of the brake control system and connection type
- Size and routing of the cable
- Selection of the brake contactor
- Design specifications
- If necessary, a motor protection switch must be installed to protect the brake coil (see the following example)



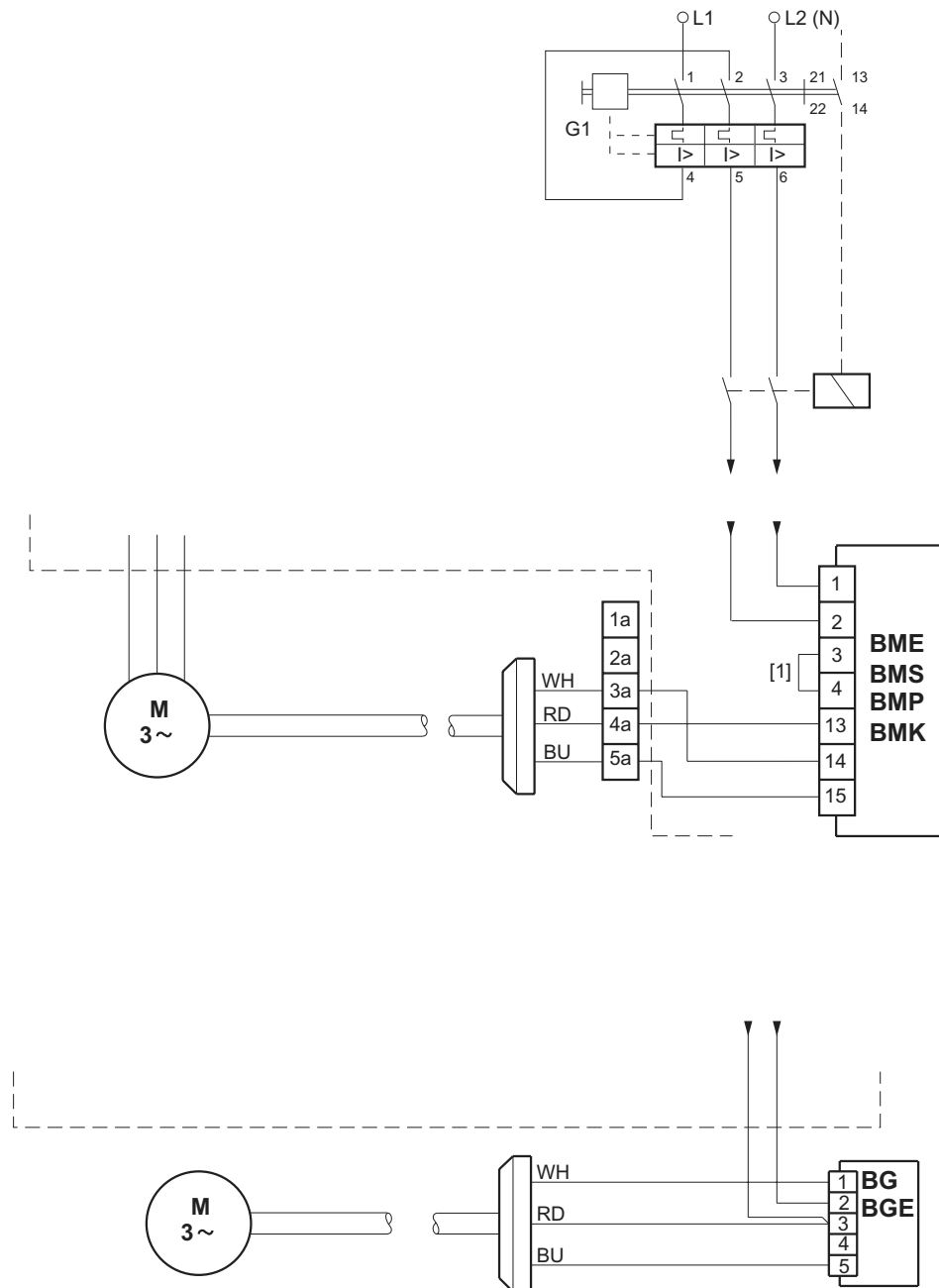
2.5.1 Motor protection switch

Motor protection switches (e.g. ABB type M25-TM) are suitable as protection against short circuits for the brake rectifier and thermal protection for the brake coil.

Select or set the motor protection switch to $1.1 \times I_{\text{Brake}}$ holding current (r.m.s. value). For the holding currents, refer to the table see section 12.5.

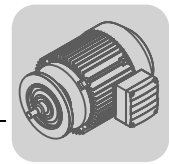
Motor protection switches are suitable for all brake rectifiers in the control cabinet (important: except for the BMH heating function) and in the terminal box with separate voltage supply.

Advantage: Motor protection switches prevent the brake coil from being destroyed when a fault occurs in the brake rectifier or when the brake coil is connected incorrectly (keeps costs resulting from repairs and downtimes low).



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[1] Customers are responsible for connecting terminals 3 and 4.



2.5.2 Selection of the brake and braking torque in accordance with the project planning data (motor selection)

The mechanical components, brake type and braking torque are determined when the drive motor is selected. The drive type or application areas and the standards that have to be taken into account are used for the brake selection.

Selection criteria:

- AC motor with one speed / pole-changing motor
- Speed-controlled AC motor with frequency inverter
- Servomotor
- Number of braking operations during service and number of emergency braking operations
- Working brake or holding brake
- Amount of braking torque ("soft braking" / "hard braking")
- Hoist application
- Minimum / maximum deceleration

Values determined / calculated during motor selection:

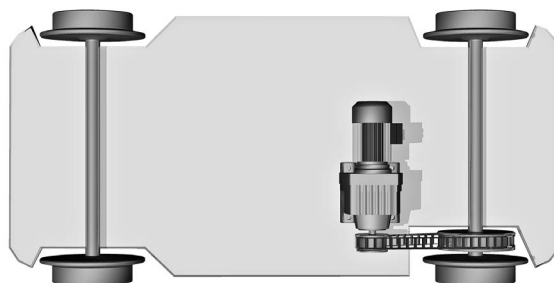
Basic specification	Link / supplement / comment
Motor type	Brake type / brake control system
Braking torque ¹⁾	Brake springs
Brake application time	Connection type of the brake control system (important for the electrical design for wiring diagrams)
Braking time Braking distance Braking deceleration Braking accuracy	The required data can only be observed if the aforementioned parameters meet the requirements
Braking work Brake service life	Maintenance interval (important for service)

1) The braking torque is determined from the requirements of the application with regards to the maximum deceleration and the maximum permitted distance or time.

For detailed information on selecting the size of the brake motor and calculating the braking data, refer to the documentation Drive Engineering - Practical Implementation 'Project Planning for Drives.'



Practical example



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A trolley with 2 driven wheels runs on rails with steel/steel friction contact with the following data:

- Velocity 0.5 m/s,
- Starting frequency 75 trips empty,
- 75 trips under load / hour
- 40 % cyclic duration factor [cdf]

Own mass	1500 kg
Max. additional load	1500 kg
Wheel diameter	250 mm
Axle diameter	60 mm
Chain reduction iv	1.588
Sprocket diameter	215 mm

The static and dynamic power of the motor is calculated from the travel resistance, with the help of practical experience for the efficiency and table values for the friction properties. The most suitable motor is determined iteratively by estimations and recalculations. The brake size is determined automatically from the motor selection.

In this case, **type DT 71D 2/BMG/Z** is selected; a 2-pole brake motor 0.55 kW with additional flywheel mass (flywheel fan).

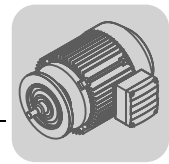
The required **braking torque** is **2.5 Nm**. This value can be achieved by selecting suitable brake springs for the BMG 05 brake (see section 12.3).

A standard **brake application time** of **0.005 s** can be achieved through cut-off in the AC and DC circuits for the standard BG brake control system in the terminal box.

The braking torque and travel resistance are used to calculate a **braking time** of **1 s**. A **braking deceleration** of **0.5 m/s²** is determined from the specified velocity of the trolley.

A **braking distance** of **252.5 mm** results from the above values.

The **braking accuracy** can be estimated with the empirically determined tolerance of $\pm 12\%$ as $\pm 30.3\text{ mm}$.



Calculating the **work done**, which is the kinetic energy converted into heat during the braking operation, gives a value for the brake wear and thus also for the **brake service life**.

The **maximum value** of the **work done** is **368 J**.

The **mean value** of the **work done** when the motor is empty and under load is **306 J**.

The value **120×10^6 J** for the **work done by the brake until maintenance** is given in the brake data table (see section 12.1). On the basis of this value, the **brake service life until maintenance** is **2600 h**. This is an important value for preventive maintenance.

Check:

Each braking operation results in friction heat at the brake disc; if the permitted load limit is exceeded this leads to increased temperature and excessive wear on the brake lining.

The table 'Maximum permitted work done per start W_{max} depending on the starting frequency and the maximum speed' for an ambient temperature of 40 °C (see sections 12.8 and 12.9) is used to check the calculated values.

In general, as in this case, the permitted starting frequency of the motor is restricted to lower values by the thermal load on the winding.

The maximum permitted work done at 75 starts / hour is 2500 J, which is higher than the calculated value for the maximum work done.

2.5.3 Determining the brake voltage

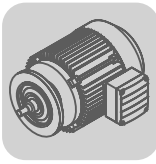
The brake voltage should always be selected on the basis of the available AC supply voltage or motor operating voltage. This means the user is always guaranteed the most cost-effective installation for lower braking currents.

In the case of multi-voltage types for which the supply voltage has not been defined when the motor is purchased, the lower voltage must be selected in each case in order to achieve feasible connection conditions when the brake control system is installed in the terminal box.

Extra-low voltages are often unavoidable for reasons of safety. However, they demand a considerably greater investment in cables, switchgear, transformers as well as rectifiers and overvoltage protection (e.g. for direct DC 24 V supply) than for connection to the supply voltage.



With the exception of BG and BMS, the maximum current flowing when the brake is released is 8.5 times the holding current. The voltage at the brake coil must not drop below 90 % of the rated voltage.



2.5.4 Selecting and routing the cable

a) Selecting the cable

Select the cross section of the brake cable according to the currents in your application. Observe the inrush current of the brake when selecting the cross section. When taking the voltage drop into account due to the inrush current, the value must not drop below 90 % of the rated voltage. The data sheets for the brakes (see the section Technical Data) provide information on the possible supply voltages and the result operating currents.

Refer to the table below for a quick source of information for selecting the size of the cable cross sections with regard to the acceleration currents for cable lengths ≤ 50 m.

Brake type	Minimum cross section in mm ² (AWG) of the brake cables for cable lengths ≤ 50 m and brake voltage (AC V)							
	42	48	56 DC24V	110	125-153	175-200	230	254-500
BR03								
BMG05								
BMG1								
BMG2								
BMG4								
BMG8								
BM15								
BM 30 - 62								
BMG61-122								

Values in brackets = AWG (American Wire Gauge)



Wire cross sections of max. 2.5 mm² can be connected to the terminals of the brake control systems. Intermediate terminals must be used if the cross sections are larger.

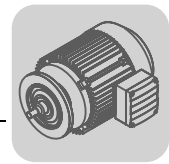
b) Routing information:

Brake cables must always be routed separately from other power cables with phased currents unless they are shielded.

Ensure adequate equipotential bonding between the drive and the control cabinet (for an example, see the documentation Drive Engineering - Practical Implementation 'EMC in Drive Engineering').

Power cables with phased currents are in particular

- Output cables from frequency inverters and servo controllers, soft start units and brake units
- Supply cables to braking resistors



2.5.5 Selection of the brake contactor



In view of the high current loading and the DC voltage to be switched at inductive load, the switchgear for the brake voltage and cut-off in the DC circuit either has to be a special DC contactor or an adapted AC contactor with contacts in utilization category AC3 to EN 60947-4-1.

It is simple to select the brake contactor for mains operation:

- For the standard voltages AC 230 V or AC 400 V, a power contactor with a rated power of 2.2 kW or 4 kW for AC3 operation is selected.
- The contactor is configured for DC3 operation with DC 24 V.

When the applications require cut-off in the DC and AC circuits for the brake, it is a good idea to install SEW switchgear to perform this task.

Control cabinet installation

Brake rectifiers (BMP, BMV and BMK, see section 3.2), which perform the cut-off in the DC circuit internally, have been specially designed for this purpose.

Terminal box installation

The current and voltage relays (SR1x and UR1x, see section 3.2), mounted directly on the motor, perform the same task.

Advantages compared to switch contacts:

- Special contactors with four AC-3 contacts are not required.
- The contact for cut-off in the DC circuit is subject to high loads and, therefore, a high level of wear. In contrast, the electronic switches operate without any wear at all.
- Customers do not have to perform any additional wiring. The current and voltage relays are wired at the factory. Only the power supply and brake coil have to be connected for the BMP and BMK rectifiers.
- Two additional conductors between the motor and control cabinet are no longer required.
- No additional interference emission from contact bounce when the brake is cut-off in the DC circuit.

Semi-conductor relay



Semi-conductor relays with RC protection circuits are not suitable for switching brake rectifiers (with the exception of BG and BMS).



2.5.6 Important design information

a) EMC (Electromagnetic compatibility)

SEW AC brake motors comply with the relevant EMC generic standards when operated in accordance with their designated use in continuous duty connected to mains power.

Additional instructions in the frequency inverter documentation must also be taken into account for operation with frequency inverters.

The EMC instructions in the servo controller documentation must also be taken into account for the operation of SEW servomotors with brake.

You must always adhere to the cable routing instructions (see page 26).

b) Connection type

The electrical design team and, in particular the installation and startup personnel, must be given detailed information on the connection type and the intended brake function.



Maintaining certain brake application times may be relevant to safety. The decision to implement cut-off in the AC circuit or cut-off in the DC and AC circuits must be passed on clearly and unambiguously to the people undertaking the work. The brake application times t_{2I} specified in the data summary (see sections 12.1 and 12.2) for cut-off in the AC circuit only apply if there is a separate voltage supply. The times are longer if the brake is connected to the terminal board of the motor.

BG and BGE are always supplied wired up for cut-off in the AC circuit in the terminal box. The blue wire on the brake coil must be moved from terminal 5 of the rectifier to terminal 4 for cut-off in the AC and DC circuits. An additional contactor (or SR / UR) must also be connected between terminals 4 and 5.

c) Maintenance intervals

The time to maintenance is determined on the basis of the expected brake wear. This value is important for setting up the maintenance schedule for the machine to be used by the customer's service personnel (machine documentation).

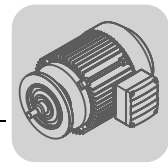
d) Measuring principles

The following points must be observed during service measurements on the brakes:



The values for DC voltage specified in the data sheets only apply if brakes are supplied with DC voltage from an external source without an SEW brake control system.

Due to the fact that the freewheeling arm only extends over the coil section, the DC voltage that can be measured during operation with the SEW brake control system is 10 to 20 % lower than the normal one-way rectification when the freewheeling arm extends over the entire coil.



3 AC Brake Motors DR/DT/DV...BR/BM(G)



For further information and detailed technical data, refer to the following documentation:

- 'Gearmotors' catalog

The BR03 brake is only used for size DR63... All other brake motors from DT56, DT71.. to DV280 operate on the principle of the BMG/BM brake.

SEW brake motors are characterized by the fact that the brake is integrated in the motor, resulting in a very short, compact design.

Various brake control systems for installation in the terminal box, with plug connection or in the control cabinet mean that the optimum solution can be found for all applications and conditions.

The standard type is supplied unless particular requirements are made.

3.1 Standard brake control system

A standard brake motor is a brake motor supplied with a terminal box and, with one exception, with built-in brake control systems. The standard type is delivered ready for connection.

The motor connection voltage and the brake voltage are usually specified by the customer. If the customer does not supply the relevant information, the phase voltage is selected automatically for single-speed motors and the mains voltage for pole-changing motors. The table below lists the standard AC brake motors.

Brake motor type	Standard type of brake control system for	
	AC connection	DC 24 V connection
DT56..BMG	BG	No control unit ¹⁾
DR63..BR		
DT71..BMG		BS
DT80..BMG		
DT90..BMG		
DV100..BMG		
DV112..BMG	BGE	BSG
DV132S..BMG		
DV132M..BM		
DV132ML..BM		
DV160..BM		
DV180..BM		
DV200..BM		
DV225..BM		
DV250..BMG		
DV280..BMG		-

1) Overvoltage protection must be installed by customer, see page 30



AC Brake Motors DR/DT/DV...BR/BM(G) Standard brake control system

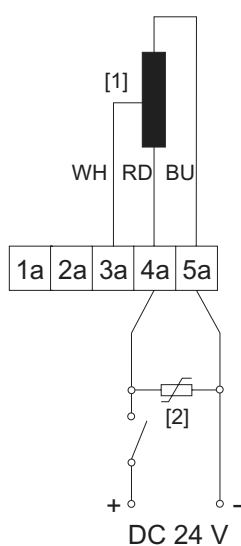
Either cut-off in the AC circuit or cut-off in both the DC and AC circuits is possible with standard types for AC connection.

The brake voltage can either be supplied separately (particularly with pole-changing motors) or taken directly from the motor terminal board (with single-speed motors).

The response times t_{2I} for cut-off in the AC circuit (see Technical Data, section 12.1) apply to the separate power supply. With the terminal board connection, switching the motor off with remanent energization leads to a further delay before the brake is applied.

The specified brake control systems have powerful overvoltage protection for the brake coil and switching contact.

A brake control system is not supplied with the standard type for DC 24 V voltage supply of DT56..BMG and DR63..BR motors. The customer must install suitable overvoltage protection.



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[1] Brake coil

[2] Varistor

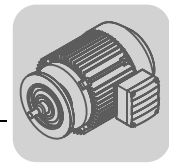
WH = White

RD = Red

BU = Blue

Example: Varistor for protecting the brake coil

Varistor type	Manufacturer
SIOV-S10 K300	EPCOS
10M 250 VB	Conradty



3.2 Brake motors for special requirements

The SEW modular concept for brake motors permits a wide variety of versions using electronic and mechanical options. The options include special voltages, mechanical manual brake release, special types of protection, plug connections and special brake control systems (see the 'Gearmotor' catalog).

3.2.1 High starting frequency

Brake motors often demand a high starting frequency and significant external mass moments of inertia.

In addition to the basic thermal suitability of the motor, the brake needs to have a response time t_1 short enough to ensure that it is already released when the motor starts. At the same time, the acceleration required for the mass moment of inertia also has to be taken into account. Without the usual startup phase when the brake is still applied, the temperature and wear balance of the SEW brake permits a high starting frequency.

Motors DV112..BMG to DV280...BMG are designed for a high starting frequency as standard.

The table below shows that besides BGE (BME) and BSG, the brake control systems BSR, BUR, BMH, BMK and BMP also have properties for shortening the response time in addition to their other functions.

Type Brake motor	High starting frequency	
	Brake control system for AC connection	Brake control system for DC 24 V connection
DR63..BR	BME (BMH, BMP, BMK) in control cabinet	BSG and BMV in control cabinet
DT71..BMG	BGE (BSR, BUR) in terminal box or BME (BMH, BMP, BMK) in control cabinet	BSG in terminal box or BMV and BSG in control cabinet
DT80..BMG		
DT90..BMG		
DV100..BMG		
DV112..BMG		
DV132S..BMG		
DV132M..BM		
DV132ML..BM		
DV160..BM		
DV180..BM		
DV200..BM		
DV225..BM		
DV250..BMG	BGE in terminal box or BME in control cabinet	-
DV280..BMG		



AC Brake Motors DR/DT/DV...BR/BM(G)

Brake motors for special requirements

3.2.2 High stopping accuracy

Positioning systems require high stopping accuracy.

Due to their mechanical principle, the degree of wear on the linings and on-site physical peripheral conditions, brake motors are subject to an empirically determined braking distance variation of $\pm 12\%$. The shorter the response times (see figure on page 11), the smaller the absolute value of the variation.

Cut-off in the DC and AC circuits makes it possible to shorten the brake application time t_{2II} considerably (see the section Technical Data).

Cut-off in the DC and AC circuits with mechanical contact:

The sections 'Basic Functions' (see section 2.3) and 'Standard brake control system' (see section 3.1.) have already referred to the possibility of achieving this solution by conventional means by using an extra contact.

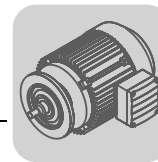
Cut-off in the DC and AC circuits with electronic relay in the terminal box:

The BSR and BUR brake control systems (see section 3.1 'Brake control systems') offer sophisticated options involving an electronic, wear-free contact with minimum wiring. Both control systems are made up of BGE (BG for size 64) and either the SR current relay or UR voltage relay.

BSR is only suitable for single-speed motors. BUR can be installed universally if it has a separate power supply.

When ordering the brake motor, it is sufficient to specify BSR or BUR in conjunction with the motor or brake voltage. The SEW order processing system assigns a suitable relay.

Refer to the table on page 33 for relay retrofitting options suited to the motor and voltage. The electronic relays can switch up to 1 A brake current and thereby limit the selection to BSR and BUR.



3.2.3 Principle and selection of the BSR brake control system

The BSR brake control system combines the BGE control unit with an electrical current relay. With BSR, the BGE (or BG) is supplied with voltage directly from the terminal board of a single-speed motor, which means that it does not need a special supply cable.

When the motor is disconnected, the motor current is interrupted practically instantaneously and is used for cut-off in the DC circuit of the brake coil via the SR current relay. This feature results in particularly fast brake application (see section 10.6) despite the remanence voltage at the motor terminal board and in the brake control system.

The brake voltage is defined automatically on the basis of the motor phase voltage without further customer data (e.g. motor 230 V Δ / 400 V \sphericalangle , brake 230 V). As an option, the brake coil can also be configured for the line-to-line voltage (e.g. motor 400 V \sphericalangle , brake 400 V).

The following table takes the brake current and the motor current into account for the assignment of the SR relay.

Motor	BSR (BGE + SR..) for motor voltage (AC V) in \sphericalangle connection																					
	40 - 58	59 - 66	67 - 73	74 - 82	83 - 92	93 - 104	105 - 116	117 - 131	132 - 147	148 - 164	165 - 185	186 - 207	208 - 233	234 - 261	262 - 293	294 - 329	330 - 369	370 - 414	415 - 464	465 - 522	523 - 690	
DR63..BR																						
DT71D..BMG																						
DT80N..BMG																						
DT80K..BMG																						
DT90S..BMG																						
DT90L..BMG																						
DV100M..BMG																						
DV100L..BMG																						
DV112M..BMG																						
DV132S..BMG																						
DV132M..BM																						
DV132ML..BM																						
DV160M..BM																						
DV160L..BM																						
DV180M..BM																						
DV180L..BM																						
DV200L..BM																						
DV225S..BM																						
DV225M..BM																						

SR11
 SR15
 SR19
 Not possible



Motor sizes 250 / 280 are offered without BSR.



AC Brake Motors DR/DT/DV...BR/BM(G)

Brake motors for special requirements

3.2.4 Principle and selection of the BUR brake control system

The BUR brake control system combines the BGE (BG) control unit with an electronic voltage relay. In this case, the BGE (or BG) control unit has a separate voltage supply because there is no constant voltage at the motor terminal board (pole-changing motors, motor with frequency inverters) and because the remanence voltage of the motor (single-speed motor) would cause a delay in the brake application time. With cut-off in the AC circuit, the UR voltage relay triggers cut-off in the DC circuit of the brake coil almost instantaneously and the brake is applied very quickly (see section 10.7).

The brake voltage is defined automatically on the basis of the motor phase voltage without further customer data. Optionally, other brake voltages can be defined in accordance with the following table.

Motor	BUR (BGE + UR..) for brake control system (AC V)																					
	40 - 58	59 - 66	67 - 73	74 - 82	83 - 92	93 - 104	105 - 116	117 - 131	132 - 147	148 - 164	165 - 185	186 - 207	208 - 233	234 - 261	262 - 293	294 - 329	330 - 369	370 - 414	415 - 464	465 - 522	523 - 690	
DR63..BR																						
DT71D..BMG																						
DT80N..BMG																						
DT80K..BMG																						
DT90S..BMG																						
DT90L..BMG																						
DV100M..BMG																						
DV100L..BMG																						
DV112M..BMG																						
DV132S..BMG																						
DV132M..BM																						
DV132ML..BM																						
DV160M..BM																						
DV160L..BM																						
DV180M..BM																						
DV180L..BM																						
DV200L..BM																						
DV225S..BM																						
DV225M..BM																						



UR11



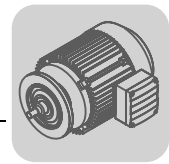
UR15



Not possible



Motor sizes 250 / 280 cannot be combined with a UR.



3.2.5 Increased ambient temperature or restricted ventilation

In addition to the basic considerations, increased ambient temperature, insufficient supply of cooling air and/or thermal class H are valid reasons for installing the brake control system in the control cabinet.

Only brake control systems with electronic switching are used in order to ensure reliable switching at higher winding temperatures in the brake.

Use of BGE, BME or BSG is stipulated instead of BG, BMS or DC 24 V direct connection for the special case of 'electrical brake release when motor is at standstill' for motor sizes 71-100.

Special versions of brake motors for increased thermal loading have to be equipped with brake control systems in the control cabinet.

3.2.6 Low and fluctuating ambient temperatures

Brake motors for low and fluctuating ambient temperatures e.g for use outdoors, are exposed to the dangers of condensation and icing. Functional limitations due to corrosion and ice can be counteracted by using the BMH brake control system with the additional function 'anti-condensation heating.'

The 'heating' function is activated externally. As soon as the brake has been applied and the heating function switched on during lengthy breaks, both coil sections of the SEW brake system are supplied with reduced voltage in an inverse-parallel connection by a thyristor operating at a reduced control factor setting. On the one hand, this practically eliminates the induction effect (brake does not release). On the other hand, it gives rise to heating in the coil system, increasing the temperature by approximately 25 K in relation to the ambient temperature.

The heating function (via K16 in the sample circuits) must be ended before the brake starts its normal switching function again.

BMH is available for all motor sizes and is only mounted in the control cabinet.



AC Brake Motors DR/DT/DV...BR/BM(G)

Brake motors for special requirements

3.2.7 Brake control system in the control cabinet

The SEW brake control systems are also available for control cabinet installation. The following aspects favor control cabinet installation:

- Unfavorable ambient conditions at the motor (e.g. motor with thermal class H, high ambient temperature > 40 °C, low ambient temperatures etc.)
- Connections with cut-off in the DC circuit by means of a switch contact are less complicated to install in the control cabinet
- Easier access to the brake control system for service purposes

When the brake control system is installed in the control cabinet, 3 cables must always be routed between the brake coil and the control system. An auxiliary terminal strip with 5 terminals is available for connection in the terminal box.

The table below gives an overview of all brake control systems available for control cabinet installation. With the exception of BSG, all units are delivered with housings for top hat rail mounting.

Brake motor type	Brake control system in the control cabinet		
	For AC connection	For DC 24 V connection	
DR63..BR03	BMS, BME, BMH, BMP, BMK	BSG BMV	
DT71..BMG			
DT80..BMG			
DT90..BMG			
DV100..BMG			
DV112..BMG	BME, BMH, BMP, BMK		
DV132S..BMG			
DV132M..BM			
DV132ML..BM			
DV160..BM			
DV180..BM			
DV200..BM			
DV225..BM			
DV250..BMG	BME		-
DV280..BMG			

3.2.8 Multi-motor operation of brake motors

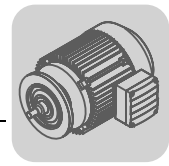
Brakes must be switched at the same time in multi-motor operation. The brakes must also be applied together when a fault occurs in one brake.

Simultaneous switching can be achieved by connecting any particular group of brakes in parallel to one brake control system.

When several brakes are connected in parallel to the same brake rectifier, the total of all the operating currents must not exceed the rated current of the brake control system.



If a fault occurs in one brake, all brakes must be cut-off in the AC circuit.



4 AC Brake Motors DR/DT/DV...BM(G) with Frequency Inverter

For further information and detailed technical data, refer to the following documentation:



- 'Gearmotors' catalog
- 'MOVIDRIVE® B' system manual and catalog
- 'MOVIDRIVE® A' system manual and catalog
- 'MOVITRAC® 07" system manual and catalog



Important: The supply voltage for the brake must always be routed separately. It cannot be taken from the terminal board of the motor due to the variable motor supply voltage.

Under normal circumstances in the frequency inverter mode of the motor, the mechanical brake only displays the characteristics of a holding brake for holding a position which has been reached and of a security brake for an emergency (emergency stop). Consequently, its size is determined by a defined number of emergency stop braking operations of the drive at full load from maximum speed (see section 2.5).

The brake command is always issued to the frequency inverter simultaneously with the stop command without any delay. It is beneficial and recommended for this command to be generated by the frequency inverter itself. Internal interlocks in the frequency inverter ensure the precise moment is selected. This allows the load to be safely accepted by the mechanical brake, thereby avoiding, for example, any 'sag' during hoist operation.

The table below gives an overview of all brake control systems possible in conjunction with frequency inverter supply to the motor.

Brake motor type	Terminal box installation	Control cabinet installation
DR63..BR03	BG, BUR No control unit	BMS, BME, BMP, BMH BSG, BMV
DT71..BMG	BG, BGE, BUR BSG	BMS, BME, BMP, BMH BSG, BMV
DT80..BMG		
DT90..BMG		
DV100..BMG		
DV112..BMG	BGE, BUR BSG	BME, BMP, BMH BSG, BMV
DV132S..BMG		
DV132M..BM		
DV132ML..BM		
DV160..BM		
DV180..BM		
DV200..BM		
DV225..BM	BGE	BME
DV250..BMG		
DV280..BMG		



5 Servomotors with Brakes DS56..B / CM71..BR - CM112..BR



For further information and detailed technical data, refer to the following documentation:

- 'Geared servomotors' catalog
- 'MOVIAXIS®' catalog and project planning manual
- 'MOVIDRIVE®' catalog
- Drive Engineering - Practical Implementation 'Servo technology'

DS56..B

Brake B of the DS servomotor is a permanent magnet brake with a standard supply voltage of DC 24 V. It operates with an unchanging brake torque of 2.5 Nm (DS56M and DS56L) and 5 Nm (DF56H). The brake cannot be retrofitted and operates without brake rectifier or brake control unit. The overvoltage protection must be implemented by the customer, for example using varistors. The brake can be used in all speed classes.

CM71..BR - CM112..BR

The BR brakes (see page 18) of the CM71 to CM112..BR servomotors can be supplied with voltage from the control cabinet via a separate plug connector or via terminal boxes. The B-side integration of the brake in the motor housing makes for a particularly compact design. Servomotors with brakes can also be supplied with a 'manual brake release' option.

The various brake control systems and the opportunity of connecting to AC 110 V, AC 230 V, AC 400 V, AC 460 V and also to DC 24 V mean that this characteristic emergency stop and holding brake can also be used in all applications involving highly dynamic qualities (see section 12.4).

The brake command in servo drives is generated in the MOVIAXIS® or MOVIDRIVE® servo controller and used for switching the brake with a suitable brake contactor.

Depending on the motor type, the BR brakes are available with two braking torques M_{B1} and M_{B2} . The higher braking torque M_{B2} (2 - 3 x M_0) is used for hoist operation for reasons of safety.

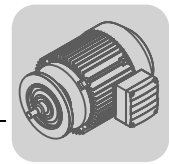
With this brake too, the size is determined by the required number of possible emergency braking operations at full load from maximum speed (see section 2.5).

5.1 Standard brake control system

Brake control systems for CM motors are designed for control cabinet installation.

The following table shows the brake control systems available.

Servomotor with brake type	Brake control system	
	AC connection	DC 24 V
CM71..BR CM90..BR CM112..BR	BME, BMP, BMH, BMK	BSG/BMV



6 ASEPTIC Motors with Brake DAS... BR



For further information and detailed technical data, refer to the following documentation:

- 'ASEPTIC Gearmotors' catalog

The BR brake for ASEPTIC motors is designed for applications that have to be cleaned regularly. Consequently, ASEPTIC motors have a very flat surface and the option of manual release is not available for the brakes.

Thanks to the fact that all frequency inverter types can be used and the opportunity of connecting to AC 110 V, AC 230 V, AC 400 V, AC 460 V and also DC 24 V, all the options of a standard AC brake motor are available with DAS motors.

- Brakes BR1 and BR2
- No manual brake release
- No adjustment required

6.1 Standard brake control system

Motor type	Brake control system	
	AC connection	DC 24 V connection
DAS80..BR DAS90..BR DAS100..BR	BG	No control unit ¹⁾

1) The overvoltage protection must be implemented by the customer, for example using varistors.

6.2 Brake control system options

Motor type	Installation in terminal box	Installation in control cabinet
DAS80..BR DAS90..BR DAS100..BR	BG, BGE without control unit, BSG, BSR, BUR	BMS, BME, BMP, BMK, BMH, BSG



7 Explosion-Proof AC Brake Motors eDT 71D4 BC05/H./TF - eDT 100L4 BC2/H./TF



For further information and detailed technical data, refer to the following documentation:

- 'Explosion-Proof AC Motors' catalog

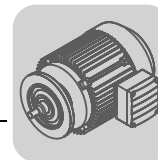
eDT...BC.. explosion-proof AC brake motors with protection type 'increased safety' operate with an integrated, flameproof brake. This combination has been certified by the Acceptance Institute of the Physikalisch-Technische Bundesanstalt (PTB) Braunschweig (the German Federal Office of Engineering Physics at Brunswick) and operates, in accordance with the BMG brake principle, with the technical data given in section 11.2.

The brake control systems in the table below are approved (only for control cabinet installation) when wired in accordance with the 'connection diagram' section on the following page. It is also essential to have thermal monitoring of the motor and the brake by means of positive temperature coefficient thermistors with an approved trip switch bearing the PTB certification 3.53 -PTC A.

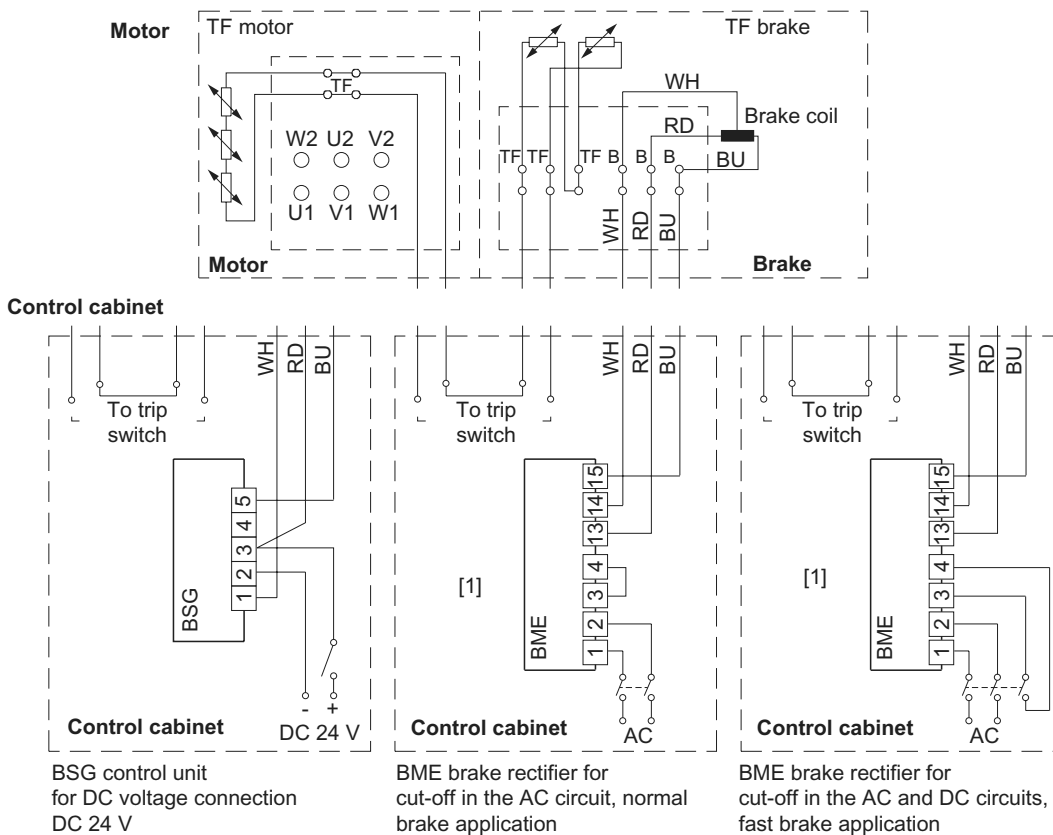
7.1 Brake control system

External measures must be taken to ensure that the brake command is issued at the same time as the motor is switched off.

Explosion-proof brake motor type	Brake control system for	
	AC connection	DC 24 V connection
eDT 71 - 100..BC	BME	BSG



7.1.1 Connection diagram



For AC voltage requirements, see the motor nameplate for brake DC V...

Switch contacts from utilization category AC 3 to EN 60947

[1] Alternative for connection to AC voltage

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8 Brakes in the VARIBLOC® Variable Speed Gear Unit



For further information and detailed technical data, refer to the following documentation:

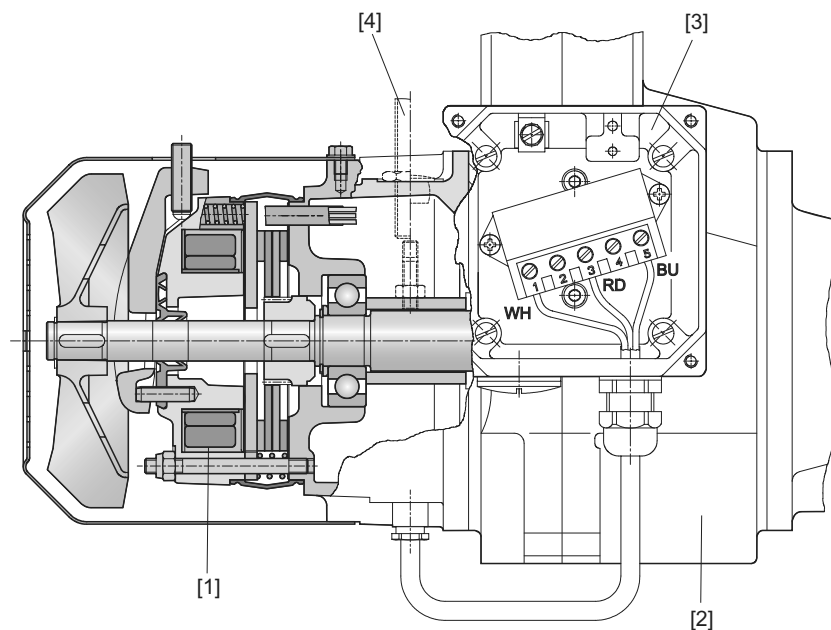
- 'Variable speed gearmotors' catalog

In view of the V-belt connection between the motor and gear unit, the brake mounted on the motor as a holding and safety brake is not permitted for many applications.

Consequently, there is a version for VARIBLOC® VU/VZ 01 - 41 with a brake on the driven variable pulley. The corresponding brake control systems are installed in a special terminal box on the variable speed gear unit.

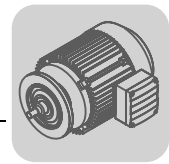
The following table provides information on the basic data for VARIBLOC® variable speed gear units with a mounted brake and lockable manual brake release as a standard feature.

VARIBLOC® variable speed gear unit Type	Motor Power range [kW]	Brake type	Maximum Braking torque [Nm]	Brake control system (standard)	
				AC	DC 24 V
VU/VZ 01 BMG/HF	0.25 ... 0.75	BMG05	5	BG	BS
VU/VZ 11 BMG/HF	0.37 ... 1.5	BMG1	10	BG	BS
VU/VZ 21 BMG/HF	0.37... 3.0	BMG2	20	BG	BS
VU/VZ 31 BMG/HF	1.5 ... 5.5	BMG4	40	BG	BS
VU/VZ 41 BMG/HF	3.0 ... 11.0	BMG8	75	BGE	BSG



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- [1] Brake bearing flange with integrated brake (complete)
 [2] Variable speed gear unit
 [3] Terminal box with brake control system
 [4] IG tachogenerator



9 Brakes in Adapters with Hydraulic Centrifugal Coupling



For further information and detailed technical data, refer to the following documentation:

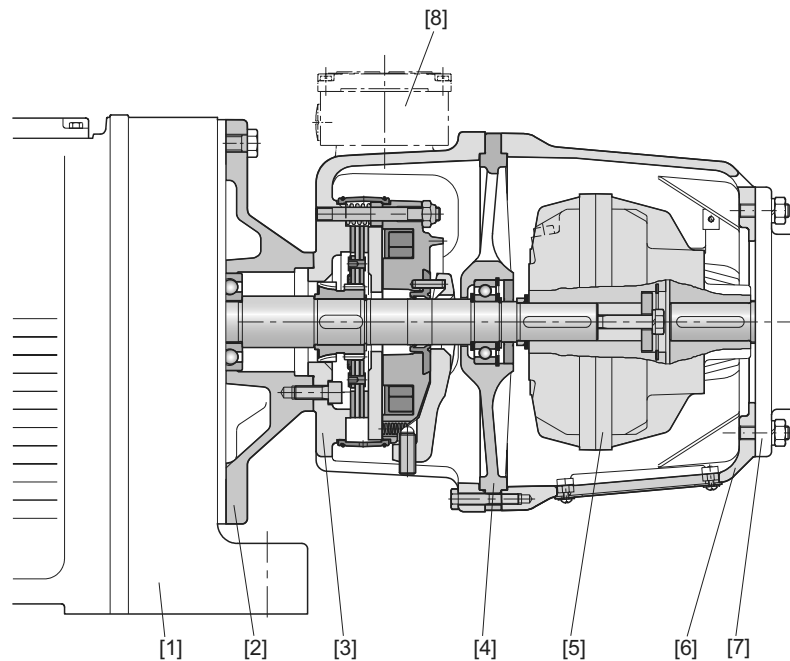
- 'Gear units' catalog

Adapters with hydraulic centrifugal coupling are also equipped with brakes in the event of special requirements for stopping the machine rapidly and safely while avoiding any reverse motion of the drive shaft when the motor is at standstill. The brake control systems are installed in a special terminal box on the extended housing.

If a second brake is required in the driveline, the hydraulic centrifugal coupling can be replaced by a fixed coupling as a special design.

The following table provides information on the basic data of adapters with hydraulic centrifugal coupling and brake as a standard feature.

Adapter with brake + Centrifugal coupling type	Brakes	Maximum braking torque [Nm]	Brake control system (standard)	
			AC	DC 24 V
AT3.../BMG	BMG8	55	BGE	BSG
AT4...BMG	BMG8	55		
AT5.../BM	BM 30	250		



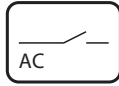
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- [1] Gear unit
- [2] Basic flange (complete)
- [3] Brake bearing flange with integrated brake (complete)
- [4] Bearing flange
- [5] Hydraulic centrifugal coupling
- [6] Extended housing (complete)
- [7] Motor
- [8] Terminal box

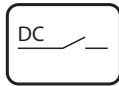


10 Block Diagrams

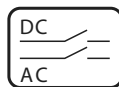
10.1 Key



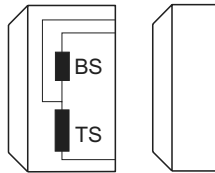
Cut-off in the AC circuit
(standard brake application)



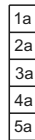
Cut-off in the DC circuit
(rapid brake application)



Cut-off in the DC and AC circuits
(rapid brake application)



Brake
BS = Accelerator coil
TS = Coil section



Auxiliary terminal strip in terminal box



Motor with delta connection



Motor with star connection

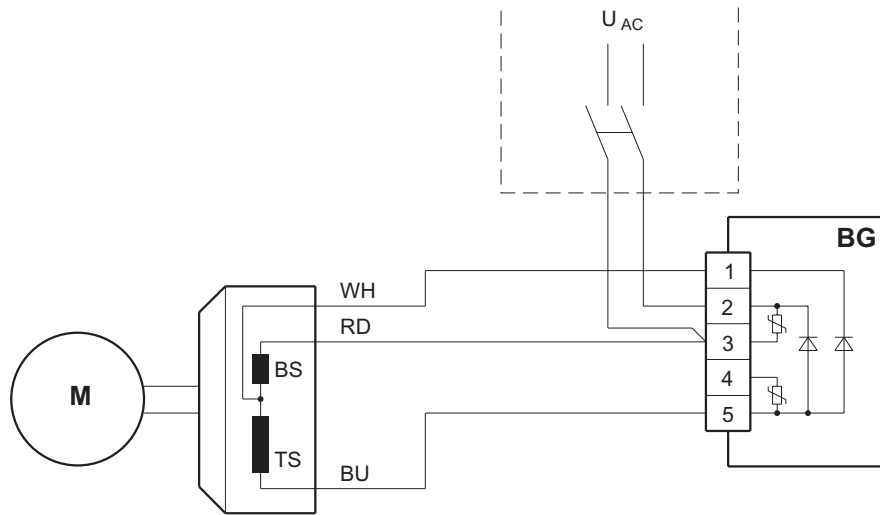
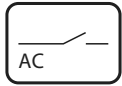


Control cabinet limit

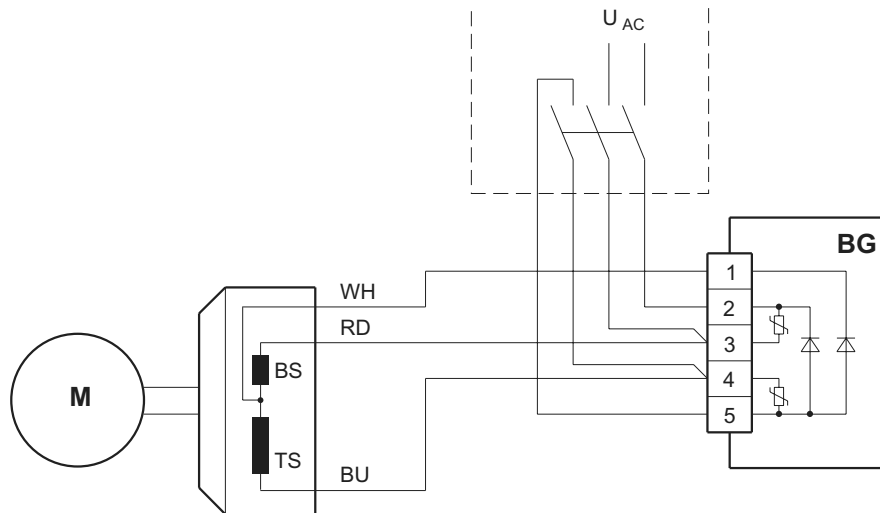
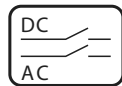
- | | |
|-----------|-------|
| WH | White |
| RD | Red |
| BU | Blue |
| BN | brown |
| BK | Black |



10.2 Brake control system BG



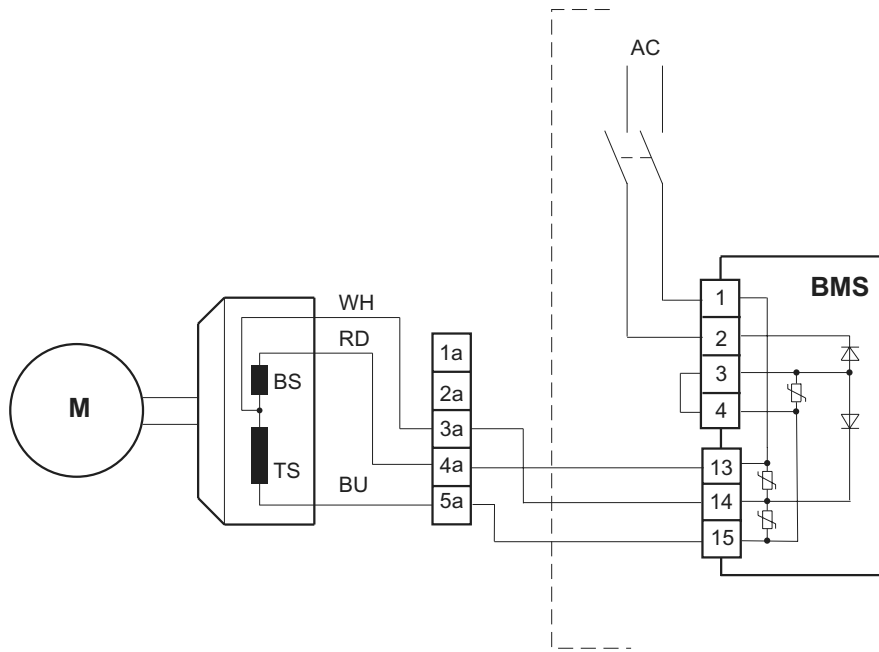
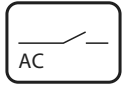
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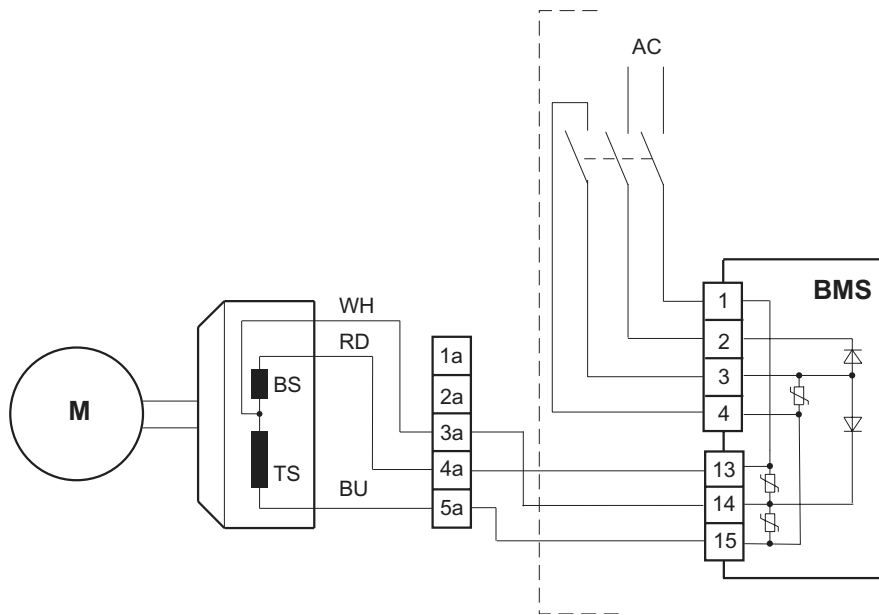
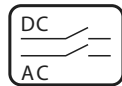
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10.3 Brake control system BMS



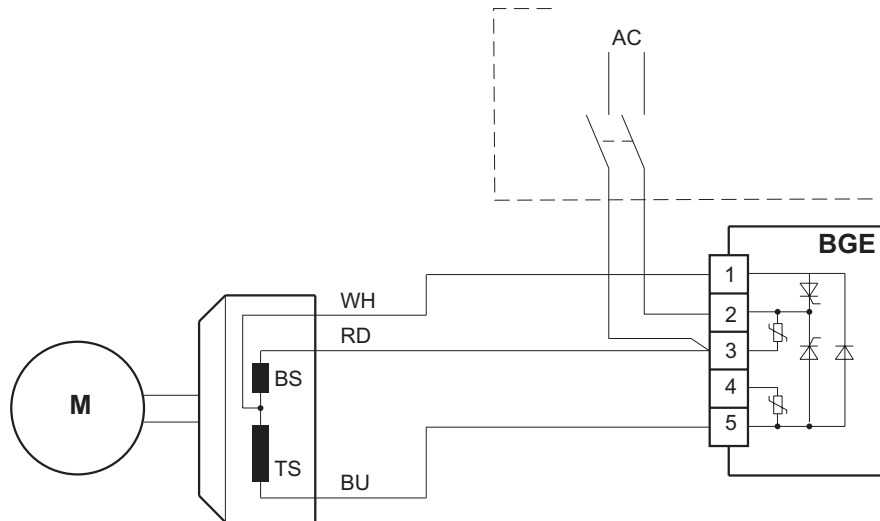
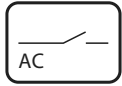
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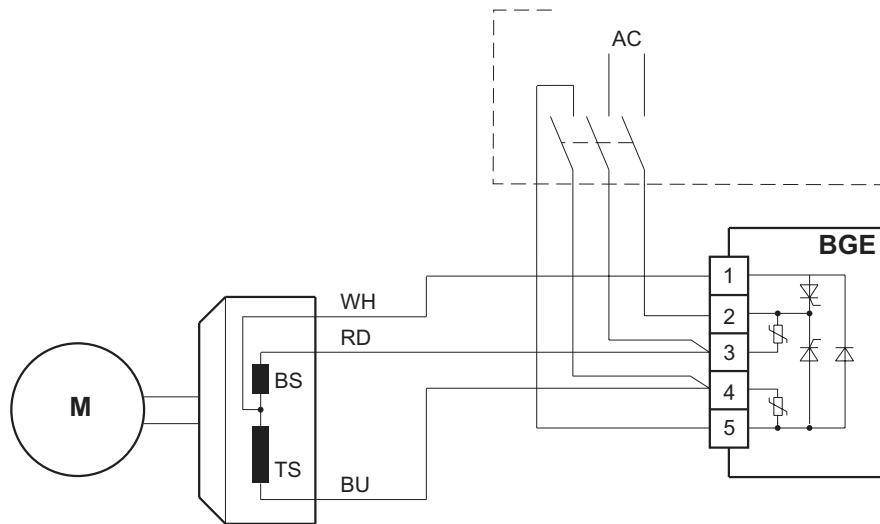
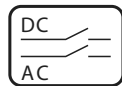
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10.4 Brake control system BGE



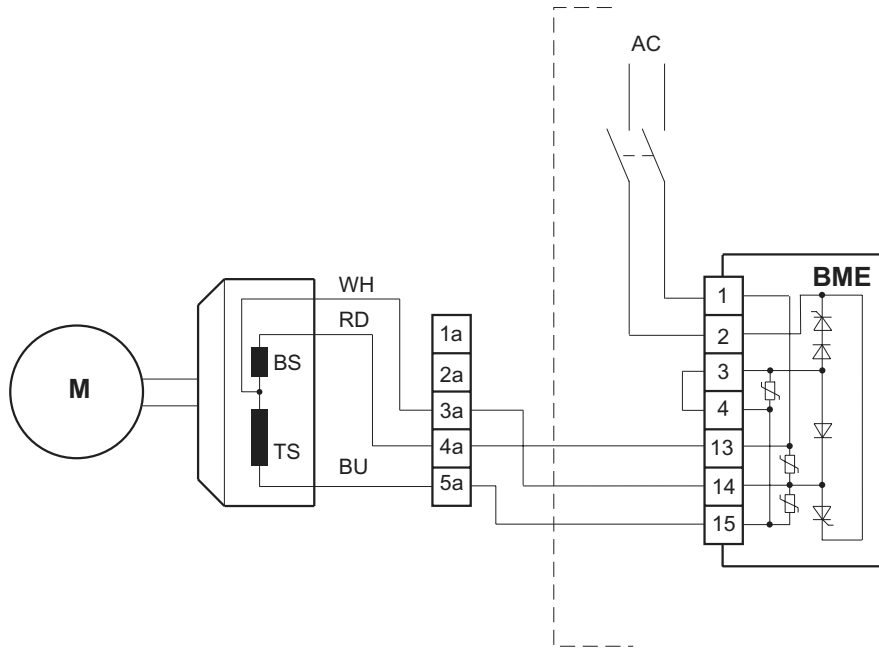
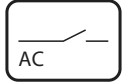
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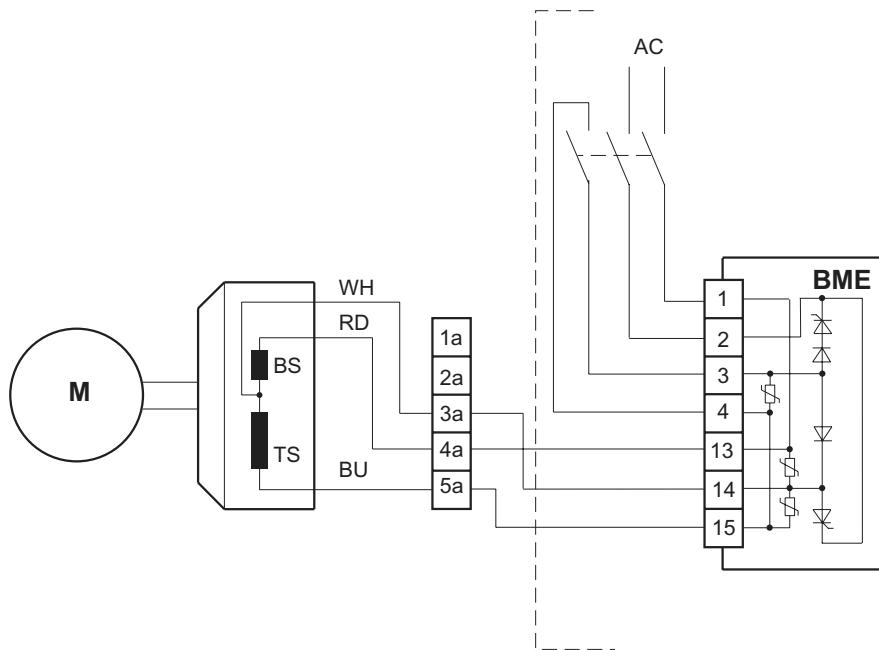
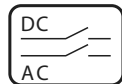
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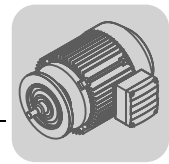
10.5 Brake control system BME



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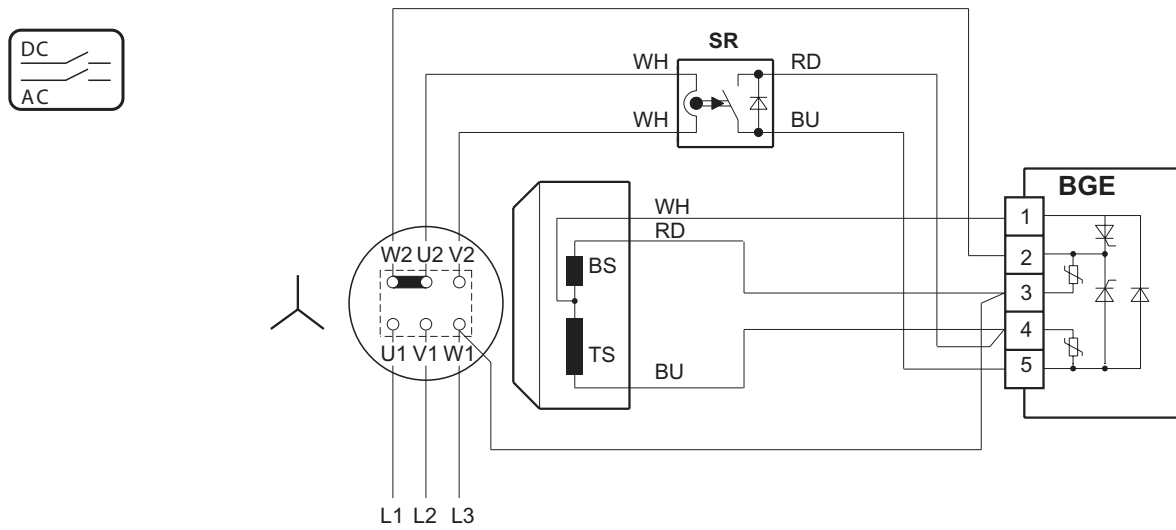
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10.6 Brake control system BSR

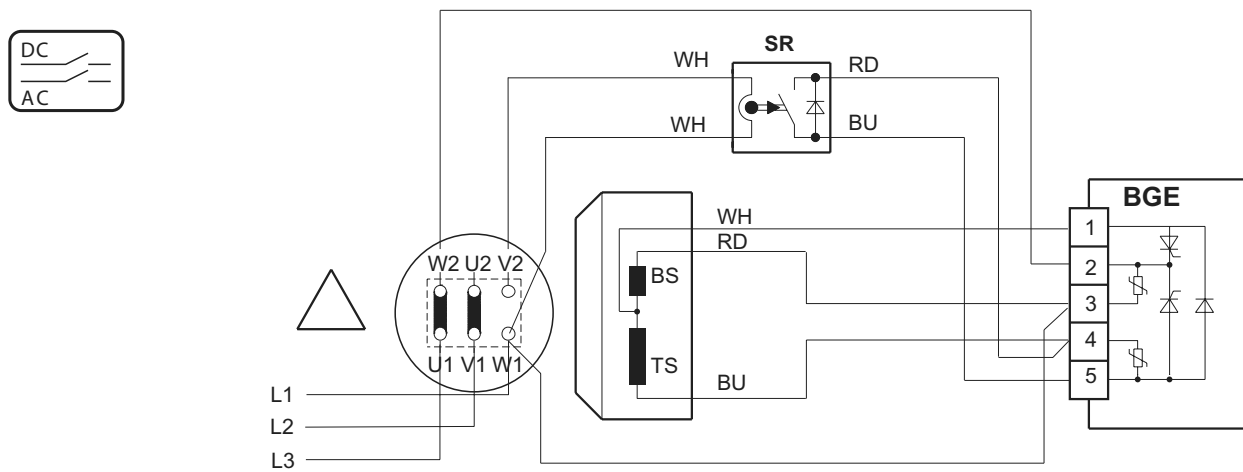
Brake voltage = Phase voltage

Example: Motor 230 V Δ / 400 V Y , brake AC 230 V



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Example: Motor 400 V Δ / 690 V Y , brake: AC 400 V



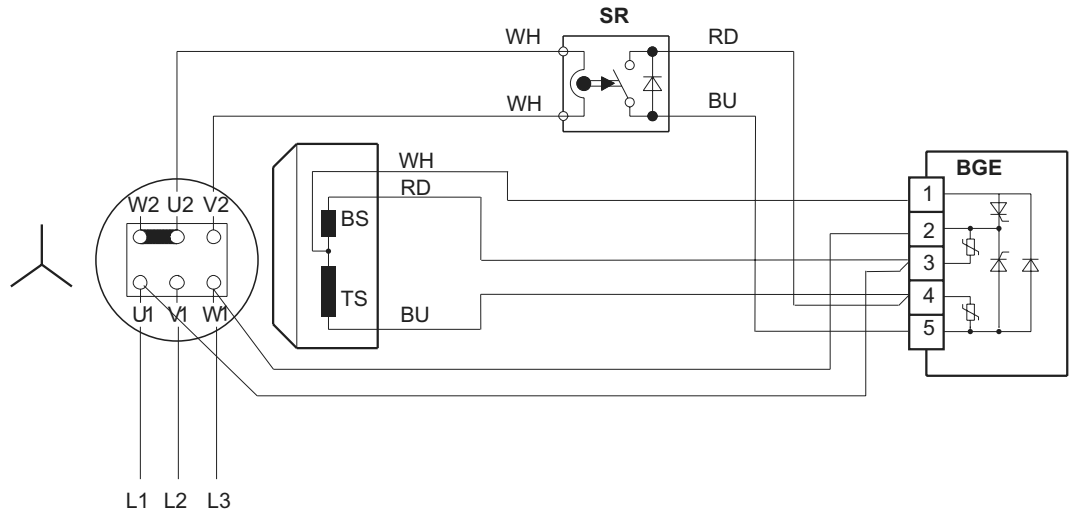
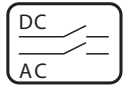
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Block Diagrams
Brake control system BSR

Brake voltage = Line voltage

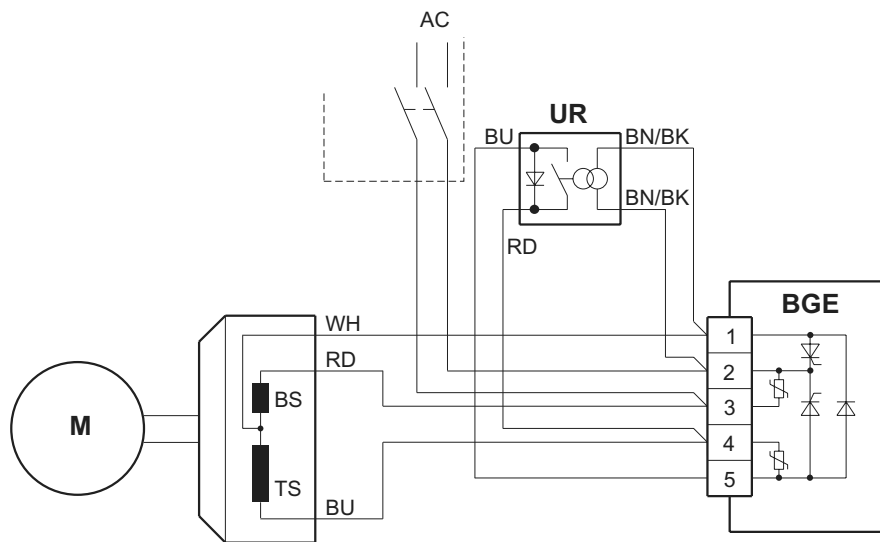
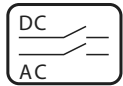
The input voltage of the brake rectifier corresponds to the line voltage of the motor, e.g. motor: 400 V Δ , brake: AC 400 V



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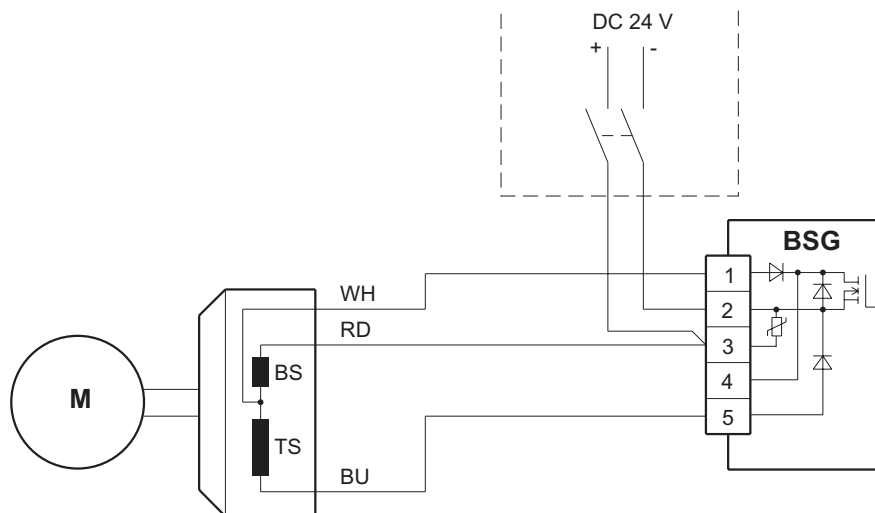
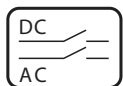


10.7 Brake control system BUR



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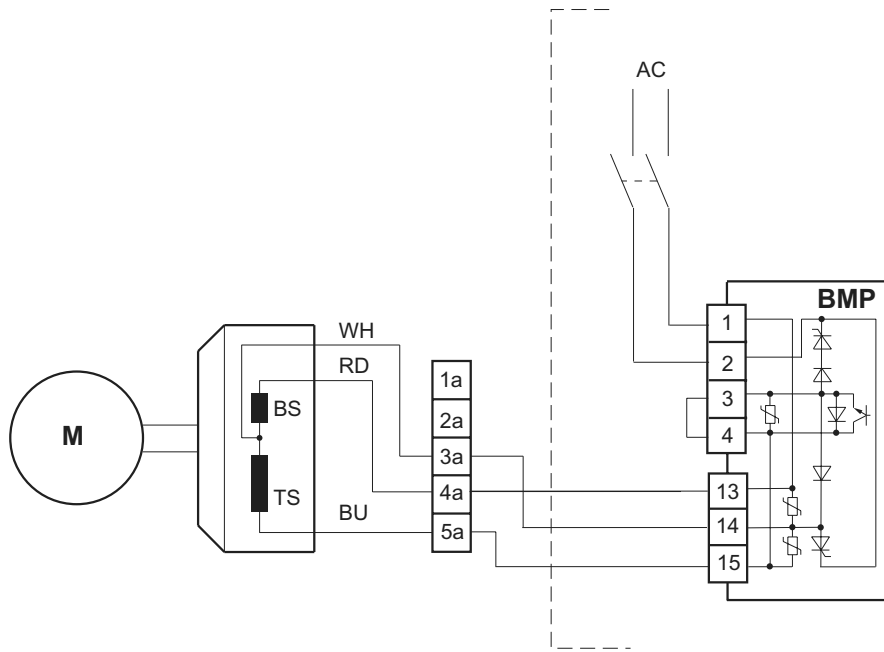
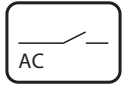
10.8 Brake control system BSG



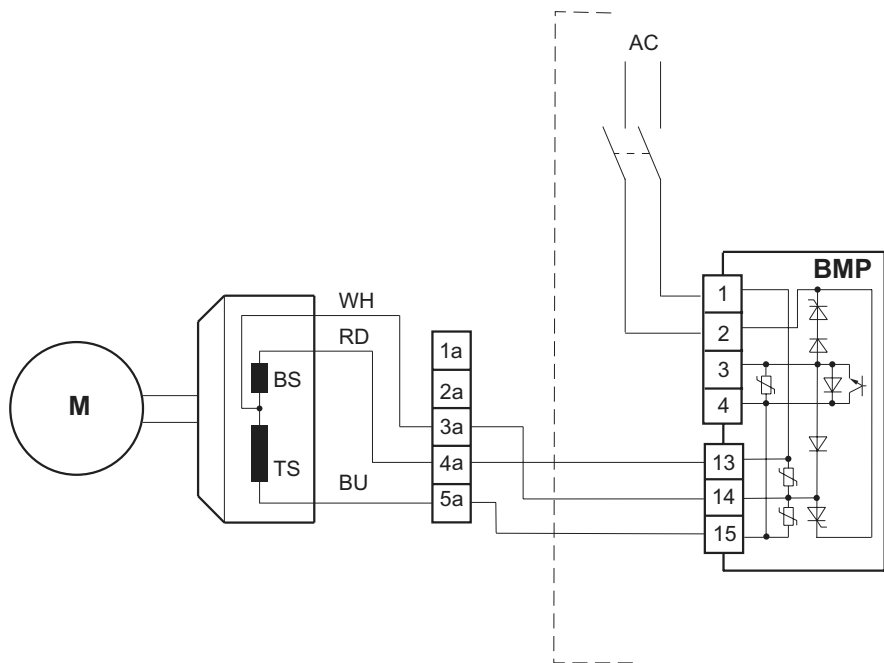
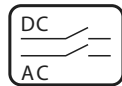
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10.9 Brake control system BMP



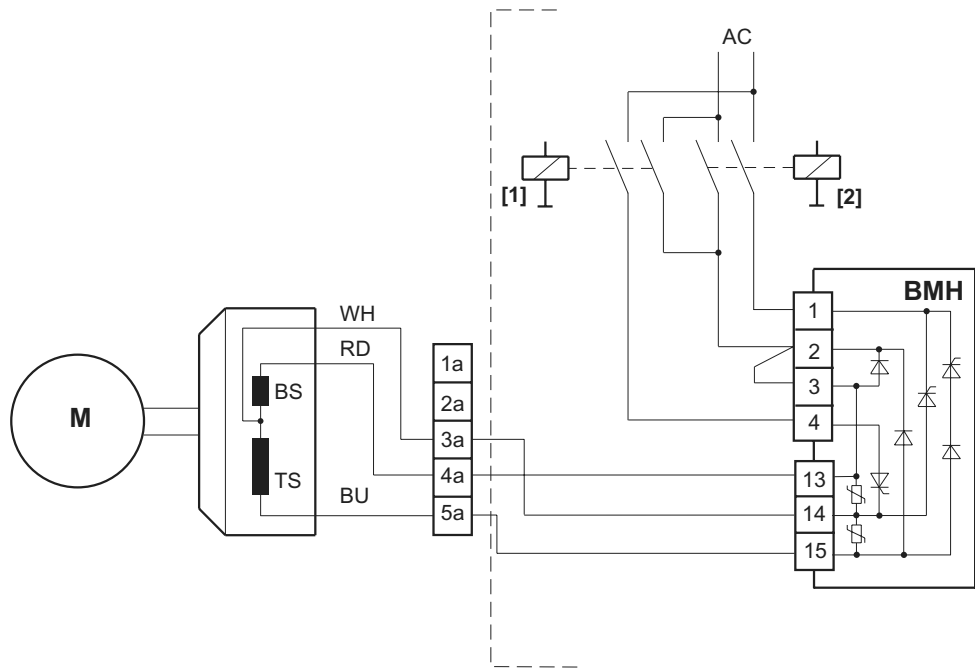
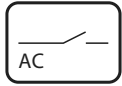
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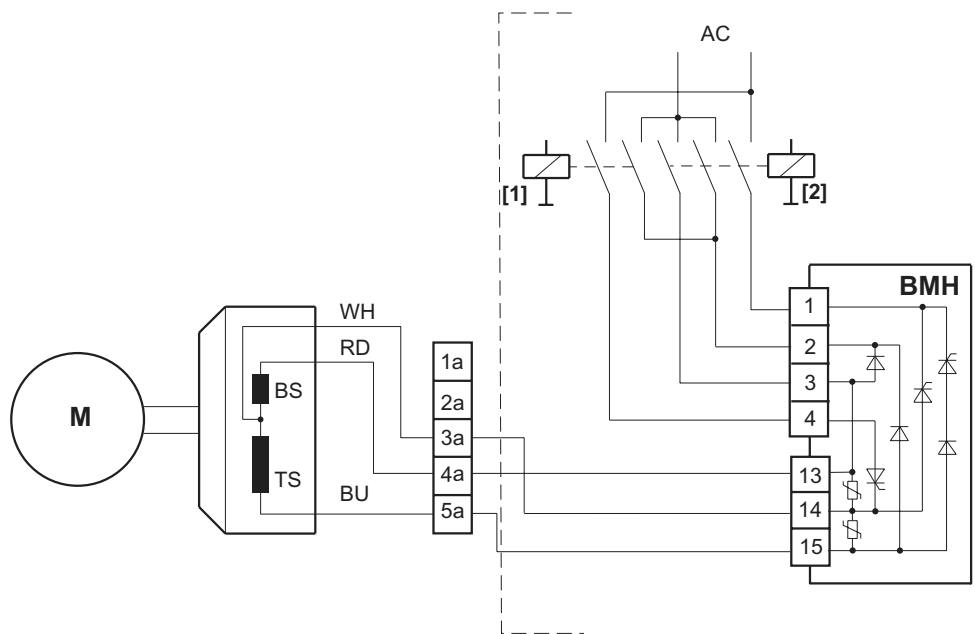
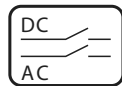


10.10 Brake control system BMH



57893AXX

- [1] Heating
- [2] Ventilation

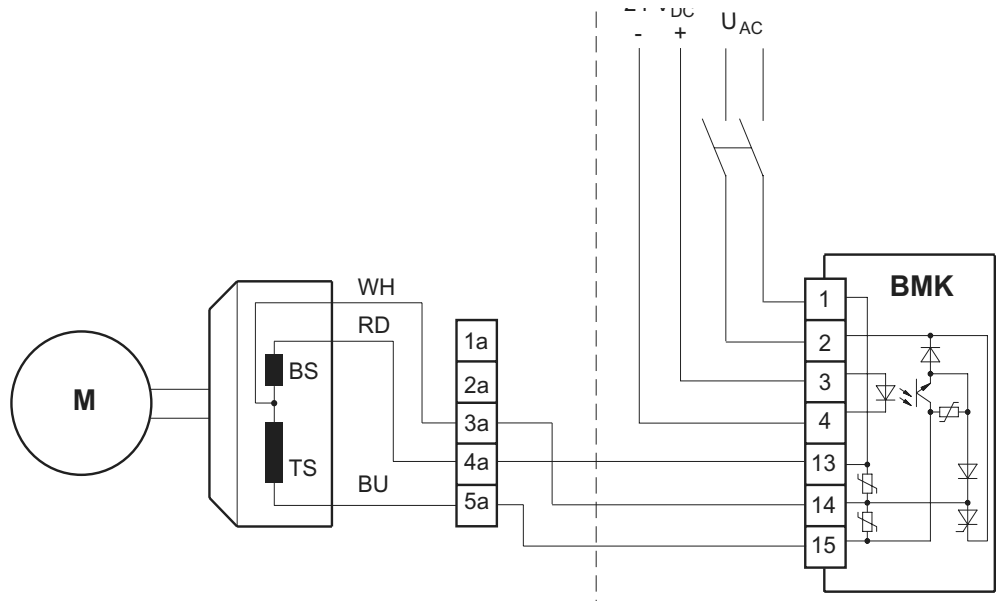
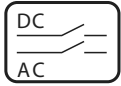


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- [1] Heating
- [2] Ventilation

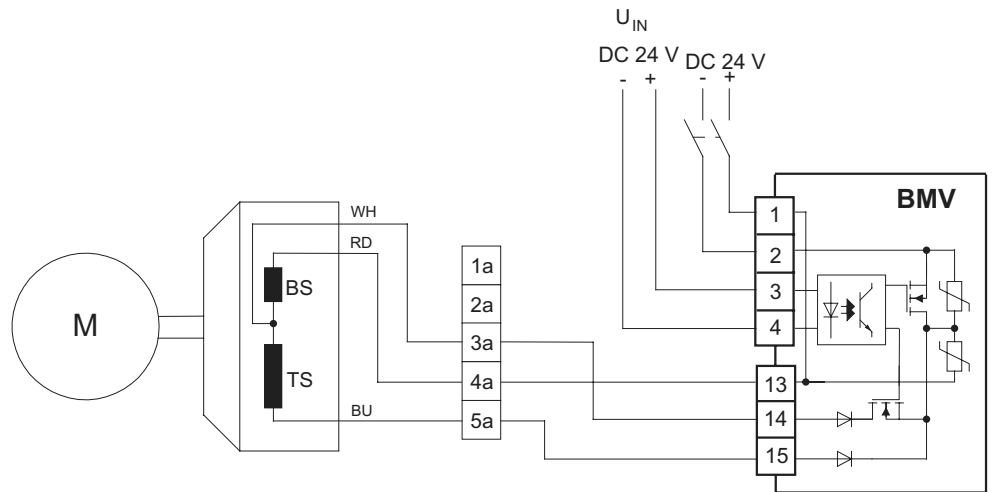
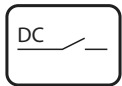


10.11 Brake control system BMK



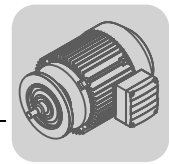
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10.12 Brake control system BMV



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U_{IN} = Control signal

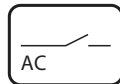


11 Sample circuits

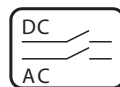
11.1 Key



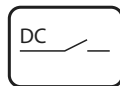
- Apply voltage (see nameplate) to release the brake, contacts operate in parallel with the motor contactor.
- Contact rating of the brake contactors AC3 to EN 60947-4-1



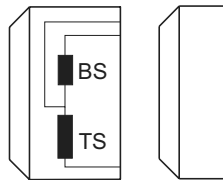
Cut-off in the AC circuit
(standard brake application)



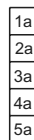
Cut-off in the DC and AC circuits
(rapid brake application)



Cut-off in the DC circuit
(rapid brake application)



Brake
BS = Accelerator coil
TS = Coil section



Auxiliary terminal strip in terminal box



Motor with delta connection



Motor with star connection

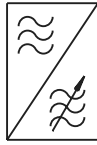


Control cabinet limit



Sample circuits

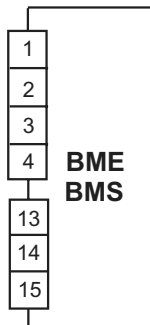
Key



Frequency inverters

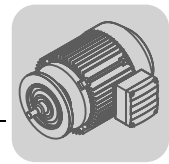


Brake control system type BG, BGE
for installation in the motor terminal box



Brake control system type BME, BMS
for installation in the control cabinet

WH	White
RD	Red
BU	Blue
BN	brown
BK	Black

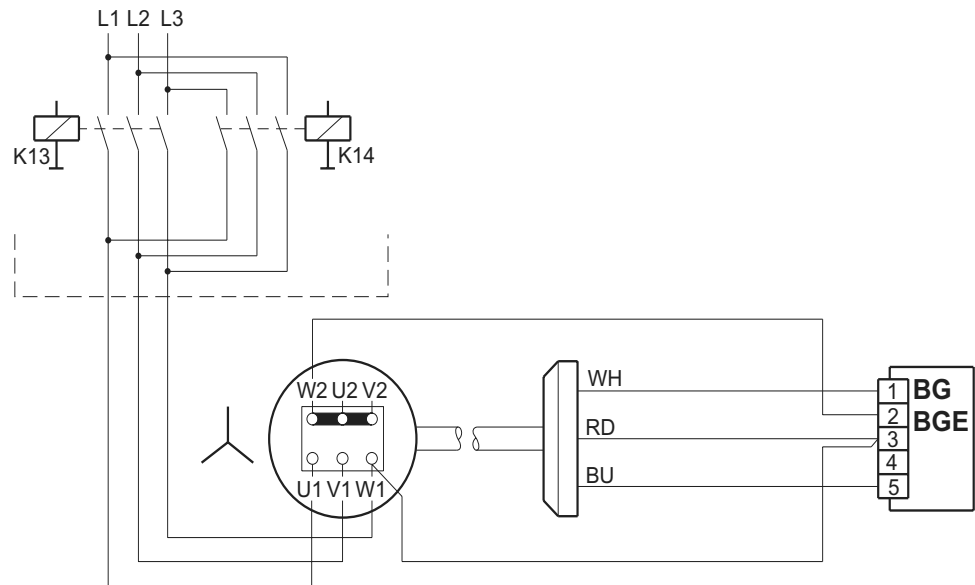
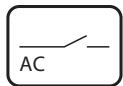


11.2 AC motors with one speed

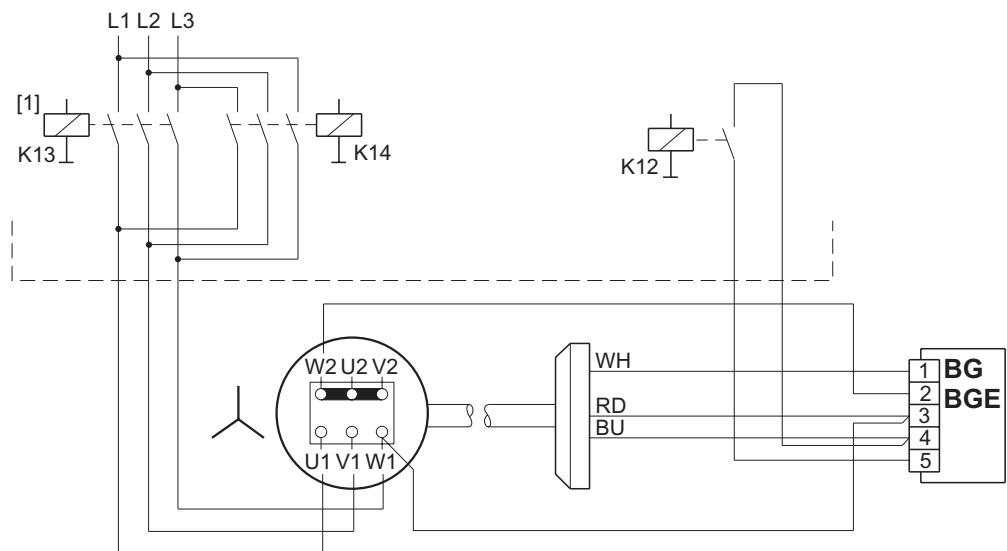
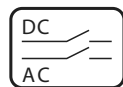
11.2.1 BG, BGE in terminal box, supply from motor terminal board

Brake voltage = Phase voltage

Example: Motor 230 V Δ / 400 V \star , brake AC 230 V



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[1] K12 is connected at the same time as K13 or K14 (direction of rotation)

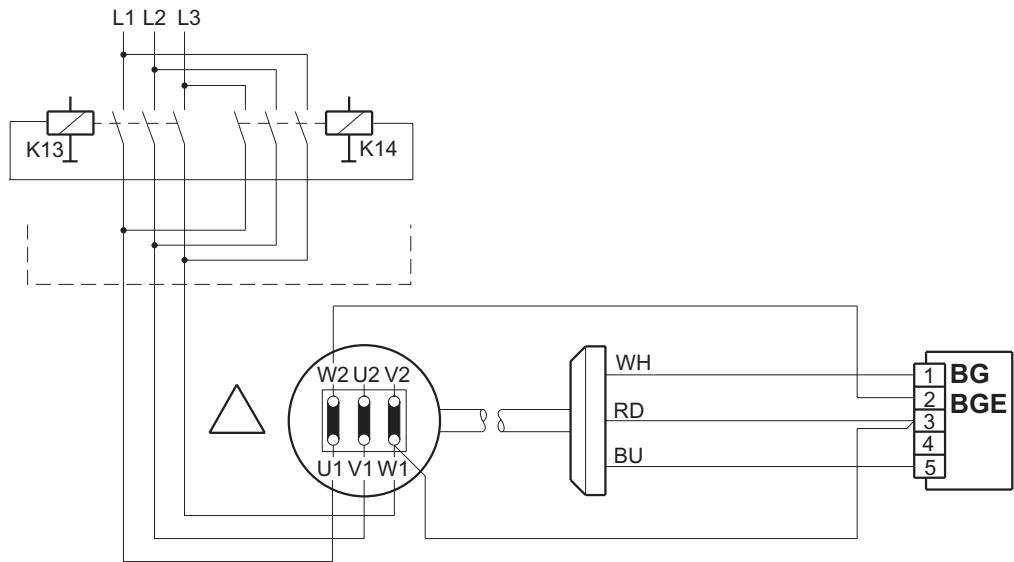
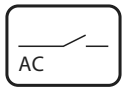


Sample circuits
AC motors with one speed

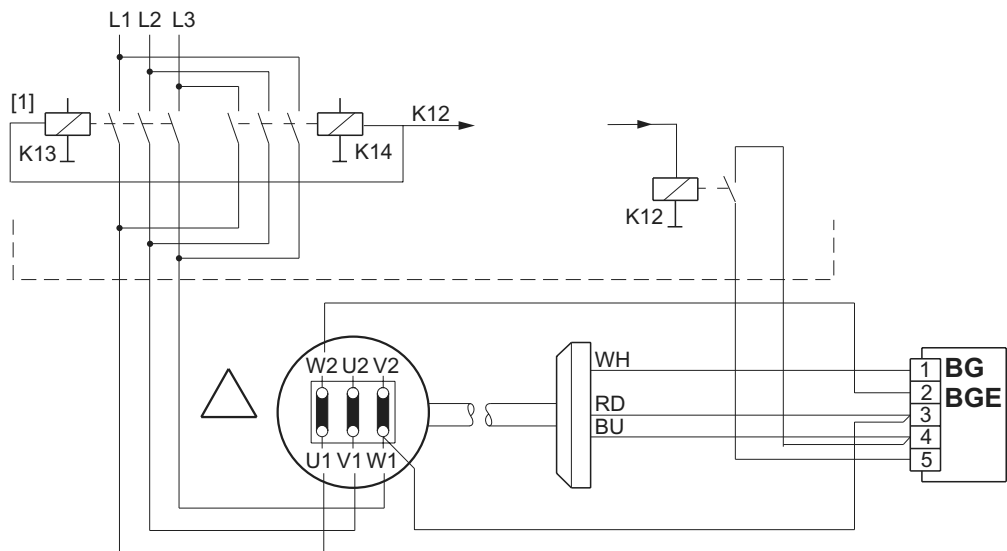
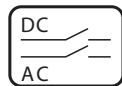
11.2.2 BG, BGE in terminal box, supply from motor terminal board

Brake voltage = Phase voltage

Example: Motor 400 V Δ / 690 V Y , brake AC 400 V

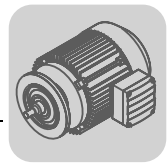


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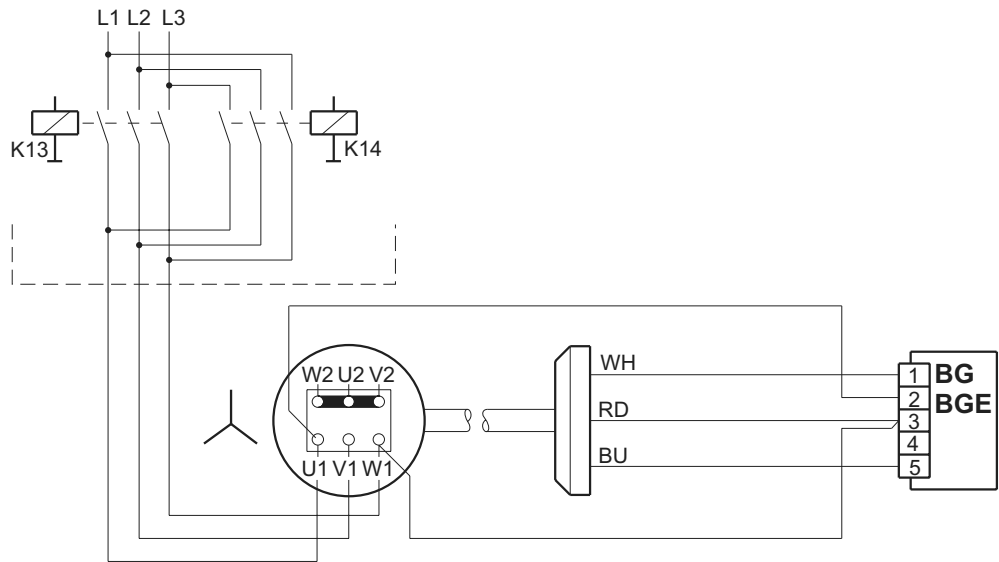
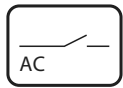
[1] K12 is connected at the same time as K13 or K14 (direction of rotation)



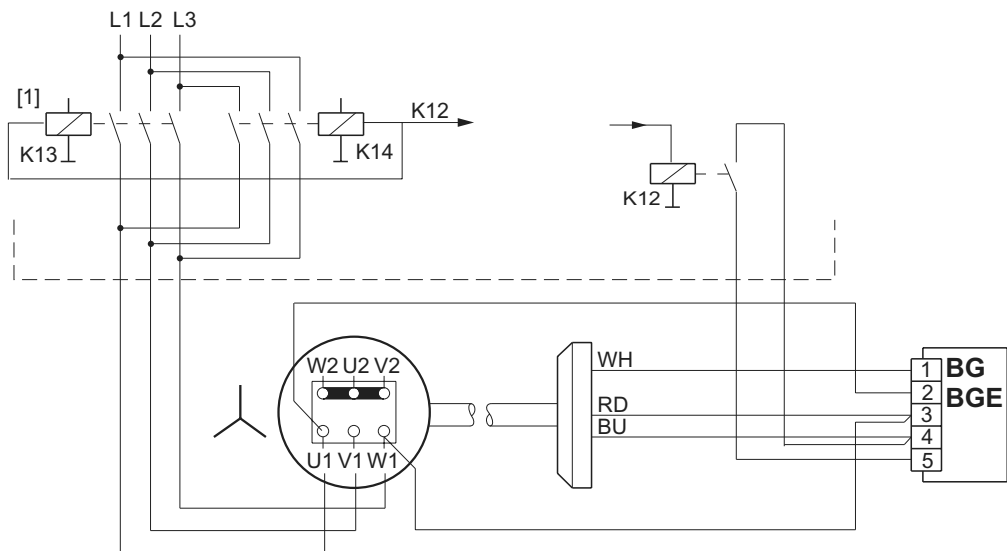
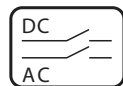
11.2.3 BG, BGE in terminal box, supply from motor terminal board

Brake voltage = Line voltage

Example: Motor 400 V Δ , brake AC 400 V



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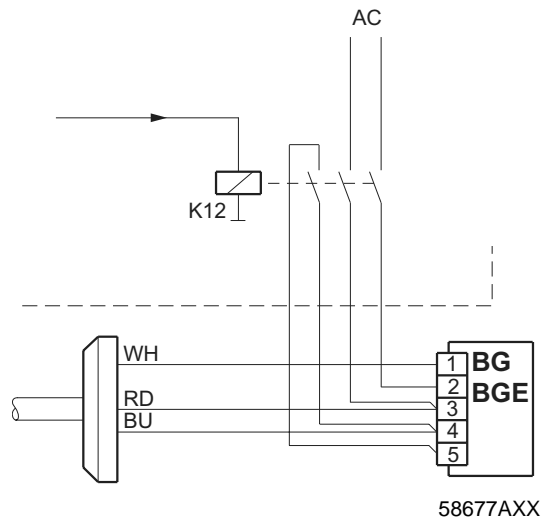
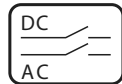
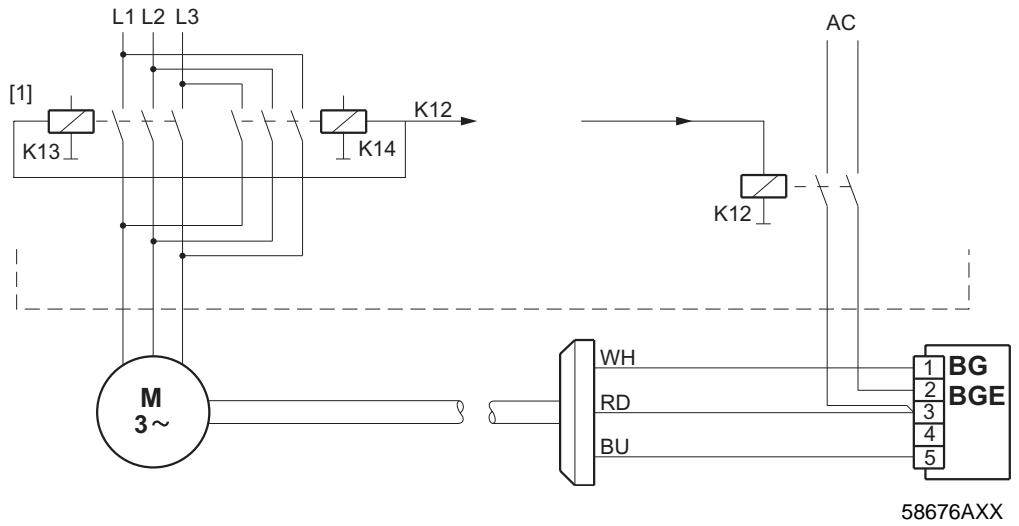
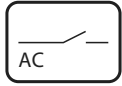
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[1] K12 is connected at the same time as K13 or K14 (direction of rotation)



Sample circuits
AC motors with one speed

11.2.4 BG, BGE in terminal box, external supply

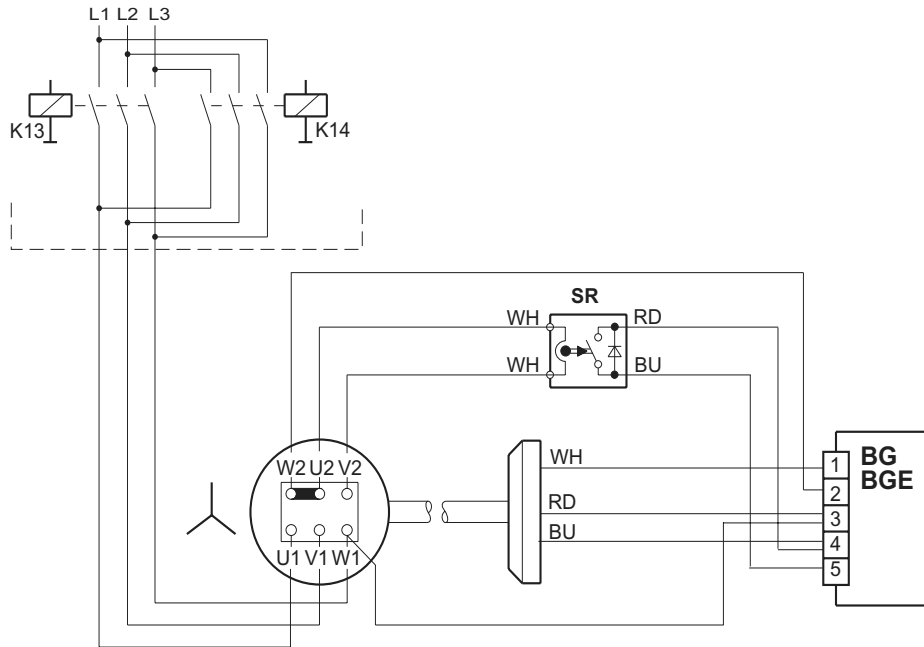
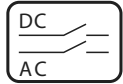




11.2.5 BSR in terminal box

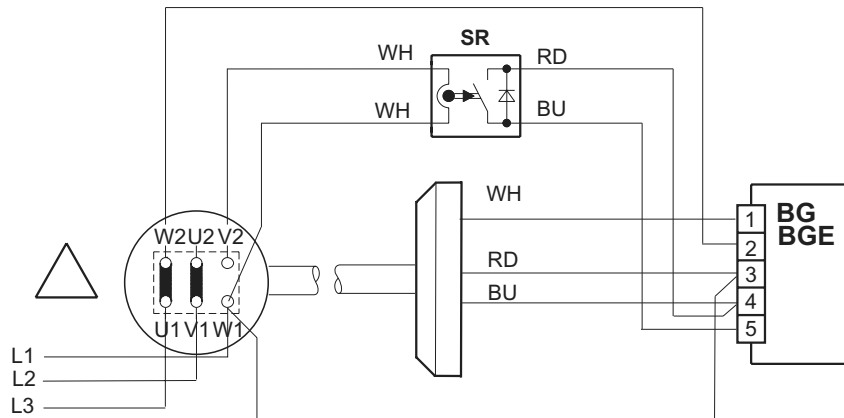
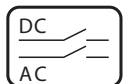
Brake voltage = Phase voltage

Example: Power supply 400 V, motor 230 V Δ / 400 V Y , brake AC 230 V



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Example: Power supply 400 V, motor 400 V Δ / 690 V Y , brake AC 400 V



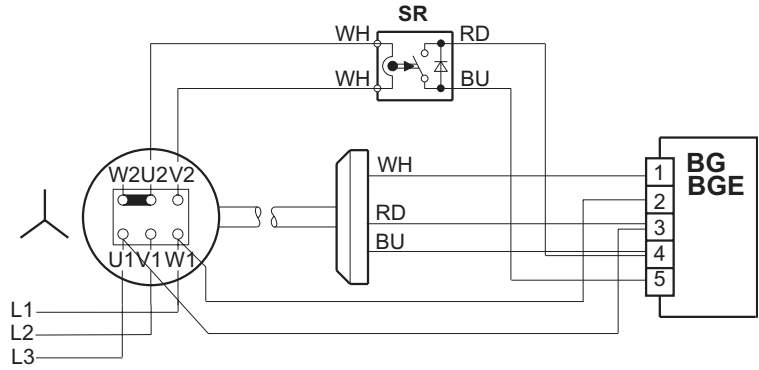
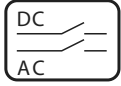
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Sample circuits
AC motors with one speed

Brake voltage = Line voltage

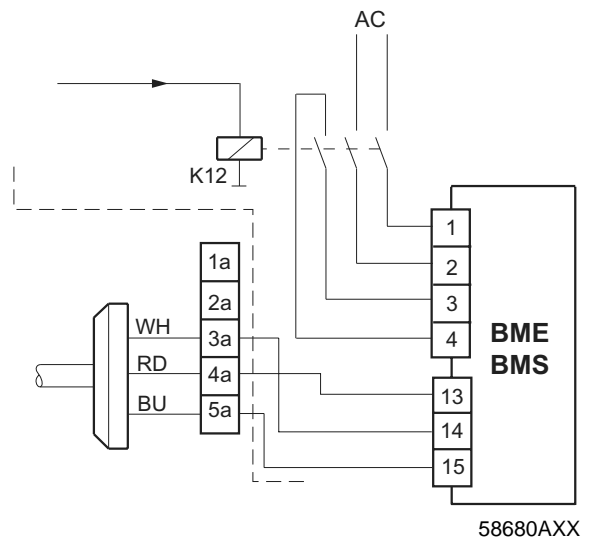
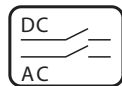
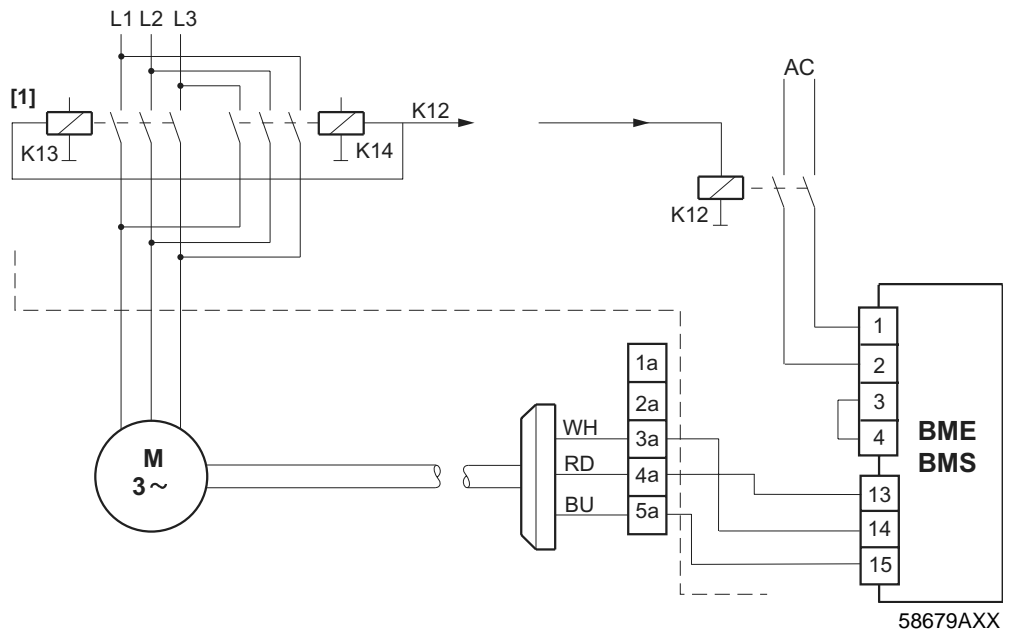
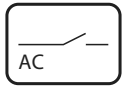
Example: Power supply 400 V, motor 400 V Δ , brake AC 400 V



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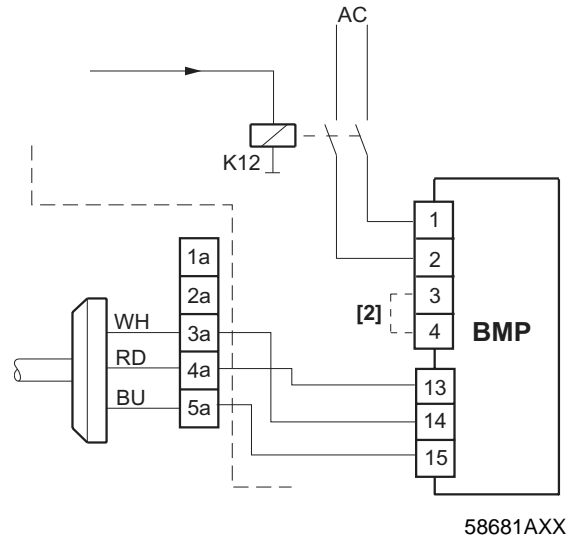
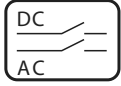


11.2.6 BMS, BME, BMP in control cabinet

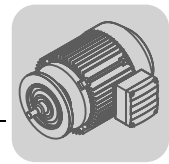




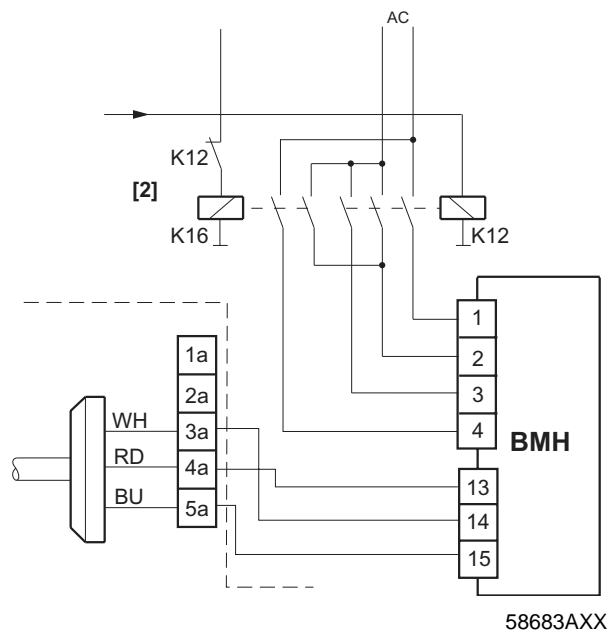
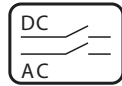
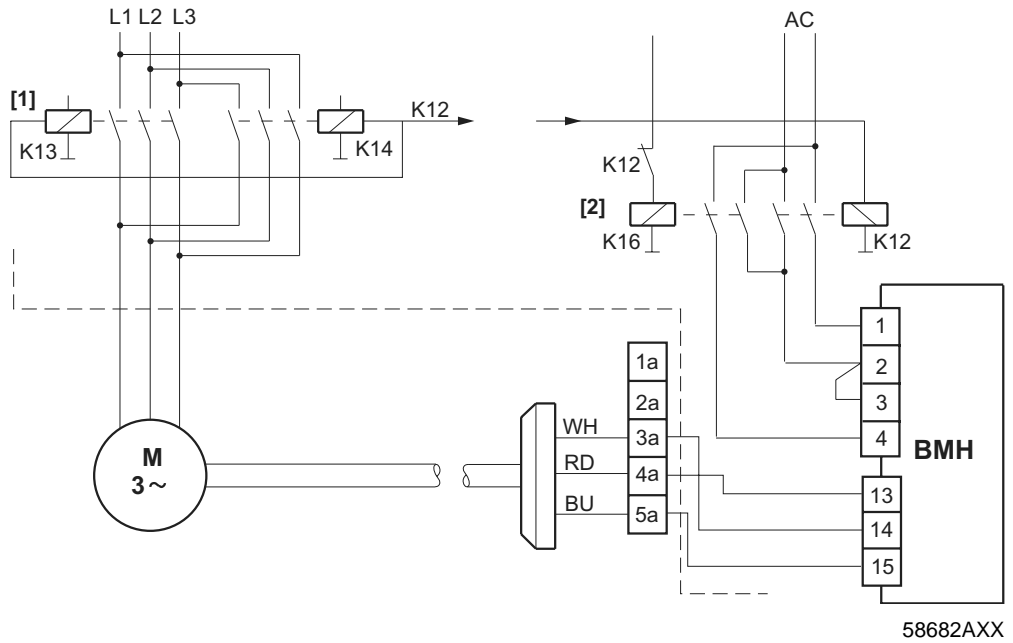
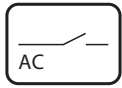
Sample circuits
AC motors with one speed



- [1] K1 is connected at the same time as K13 or K14 (direction of rotation)
- [2] Change jumper or NO contact from 3 to 4 if connection is only to be in the AC circuit



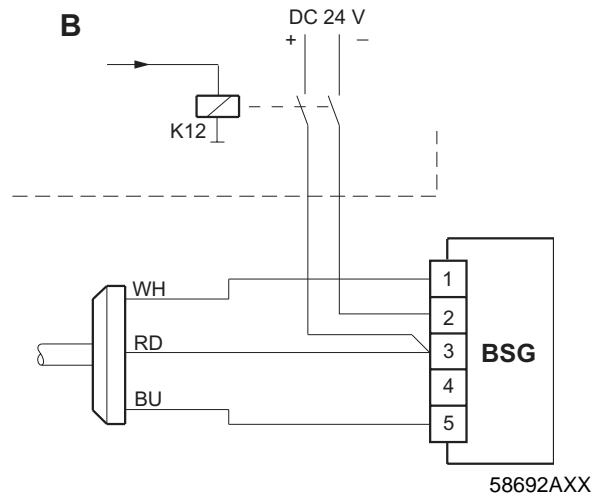
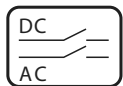
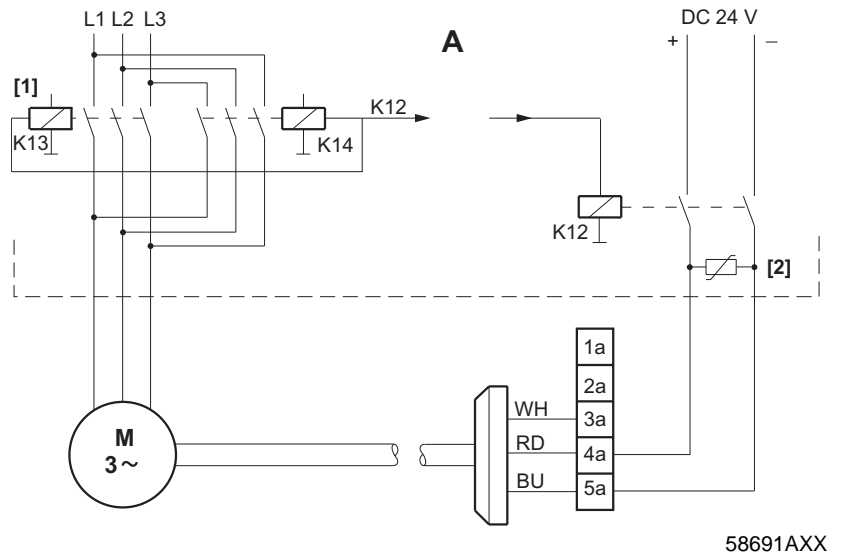
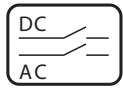
11.2.7 BMH in control cabinet

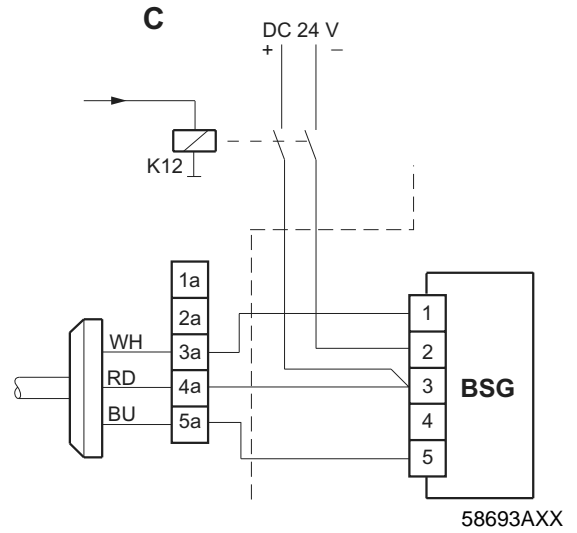
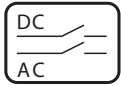


- [1] K1 is connected at the same time as K13 or K14 (direction of rotation)
- [2] K16 must be triggered to heat the brake. K16 is locked with K12. Only heat during lengthy breaks.



11.2.8 Brake control system DC 24 V

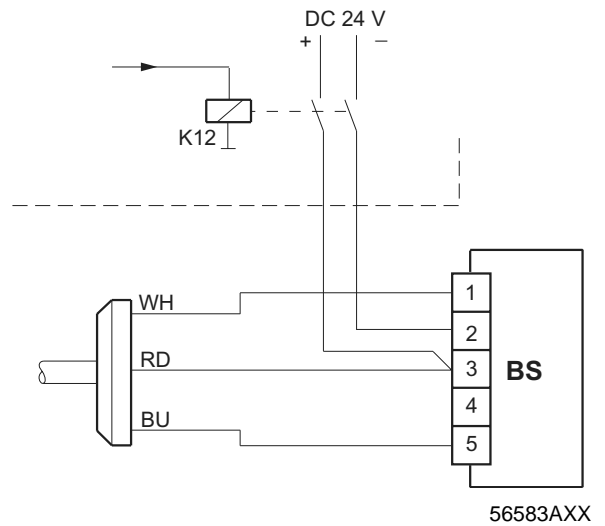
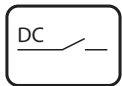




- A Standard for brake motor sizes 56 + 63 with DC 24 V brake without BSG control unit
- B Standard for brake motor sizes 112 to 225 with BSG in terminal box
- C For brake motor sizes 71 to 225 with BSG in control cabinet
- [1] K12 is connected at the same time as K13 or K14 (direction of rotation)
- [2] Protection circuit against switching overvoltages to be installed by the customer

11.2.9 BS varistor protection circuit

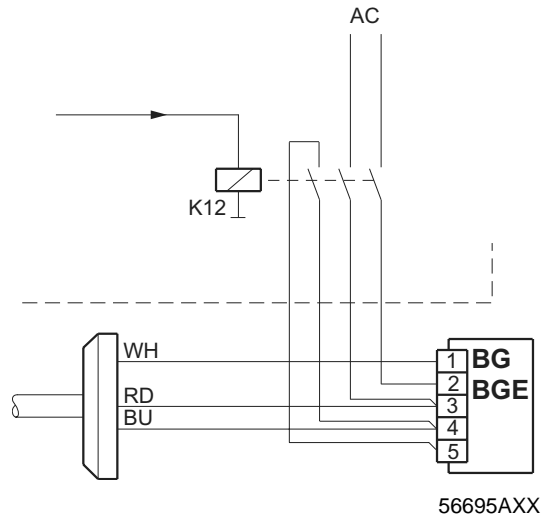
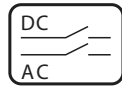
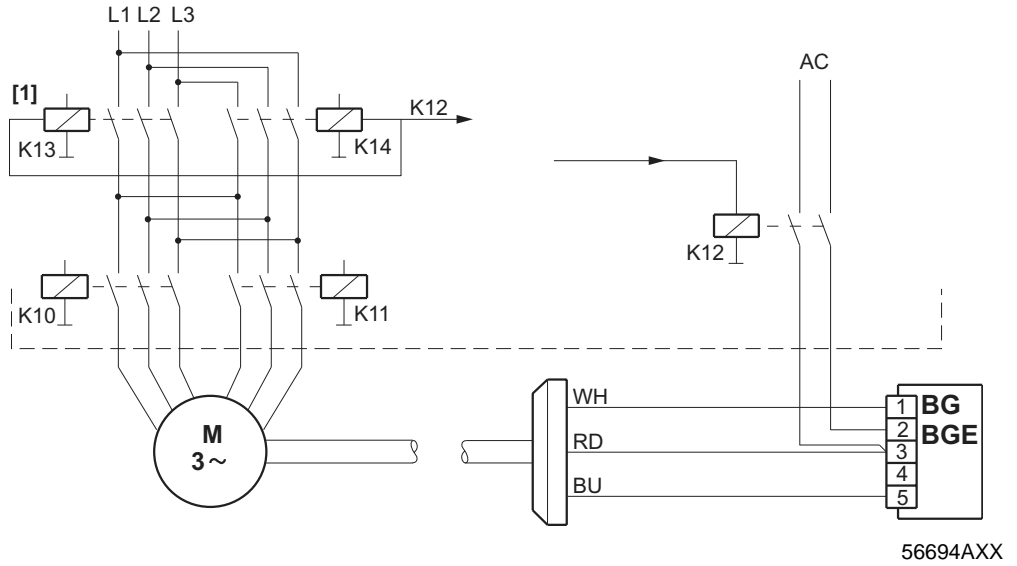
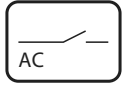
For brake motors 71-100, brake DC 24 V



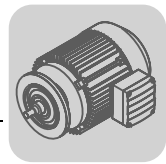


11.3 Pole-changing motors

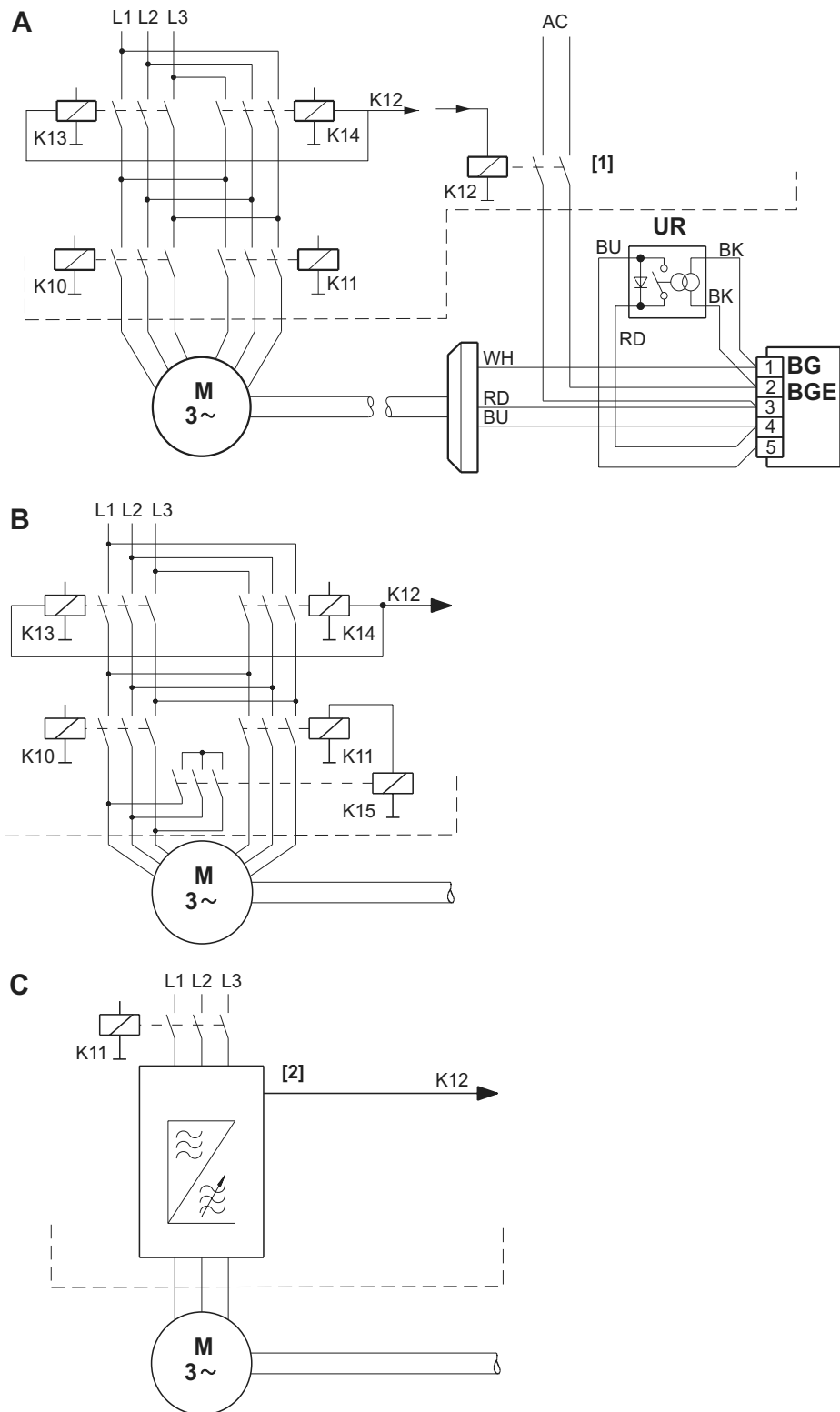
11.3.1 BG, BGE in terminal box, pole-changing motor (separate winding)



[1] K12 is connected at the same time as K13 or K14 (direction of rotation).



11.3.2 BUR with pole-changing and speed-controlled AC motors

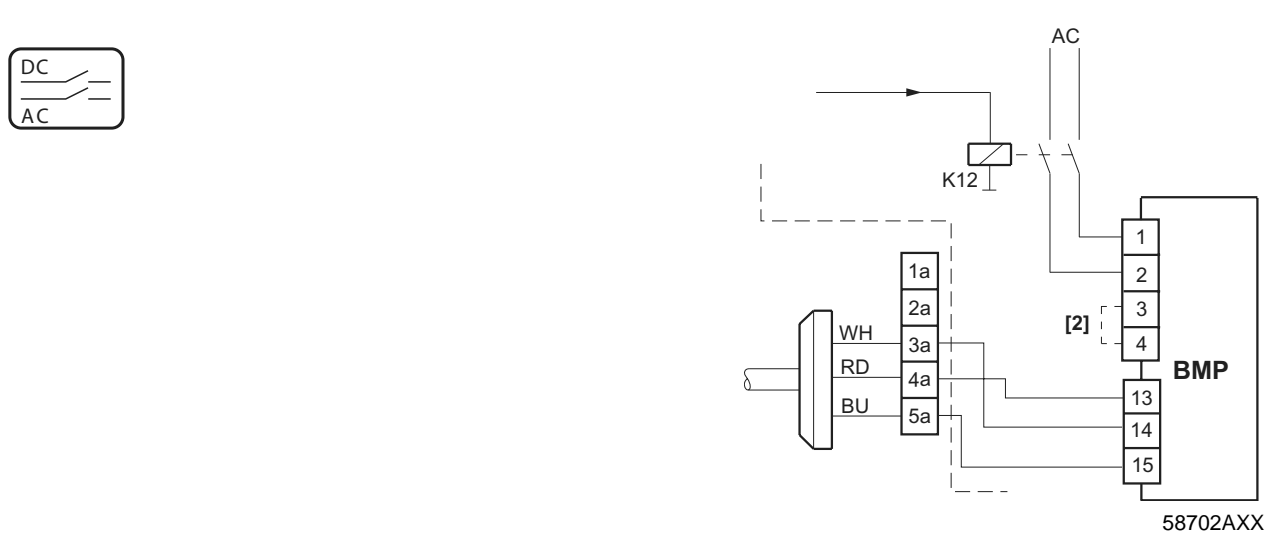
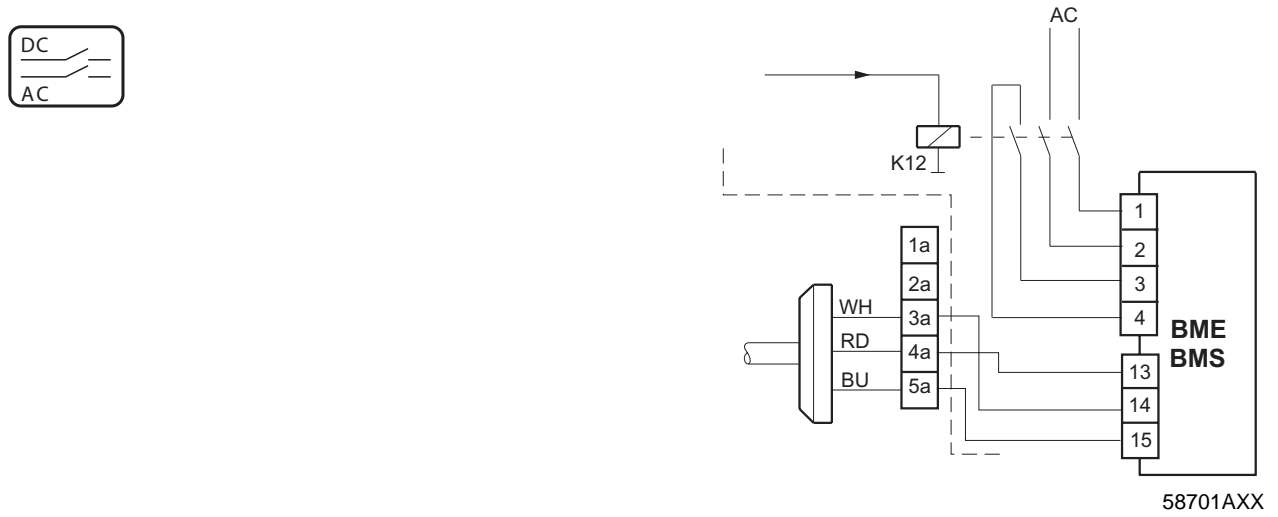
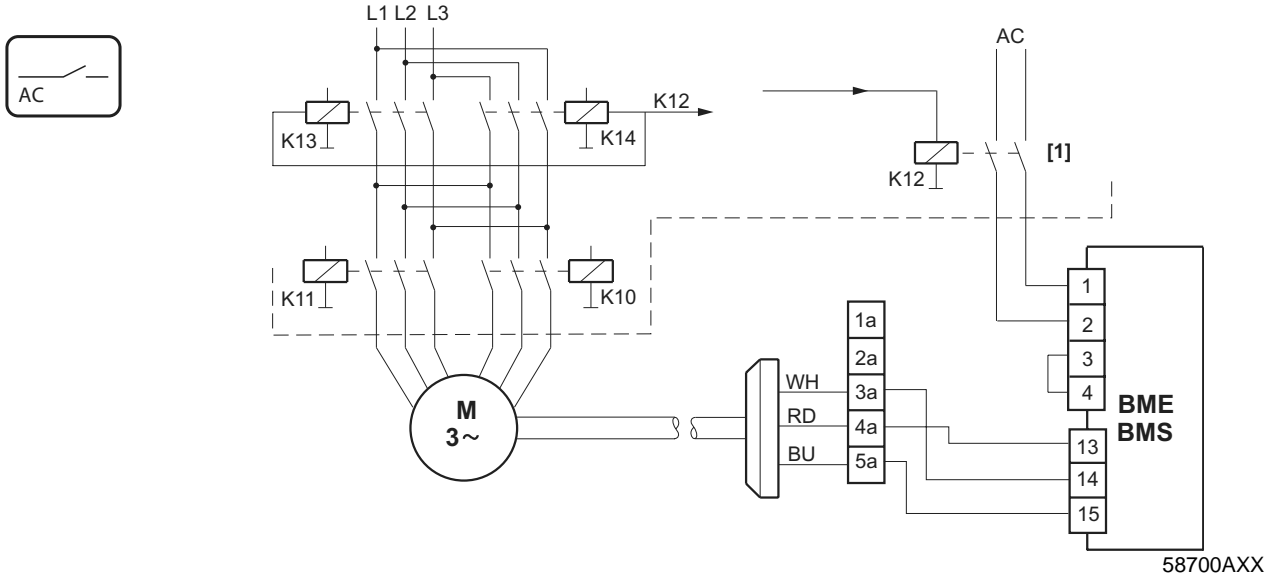


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- A Separate winding
- B Dahlander circuit
- C With frequency inverter
- [1] Voltage supply to the brake via separate supply cable.
Connection to motor terminal board not permitted.
- [2] Output brake command



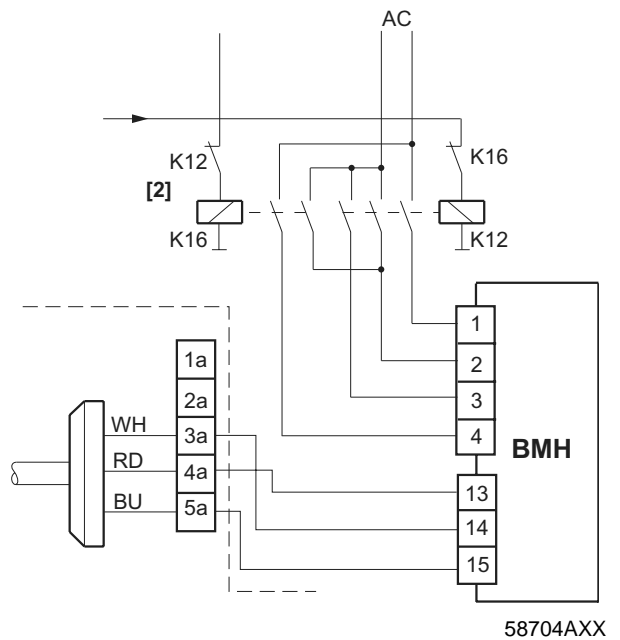
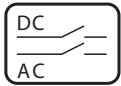
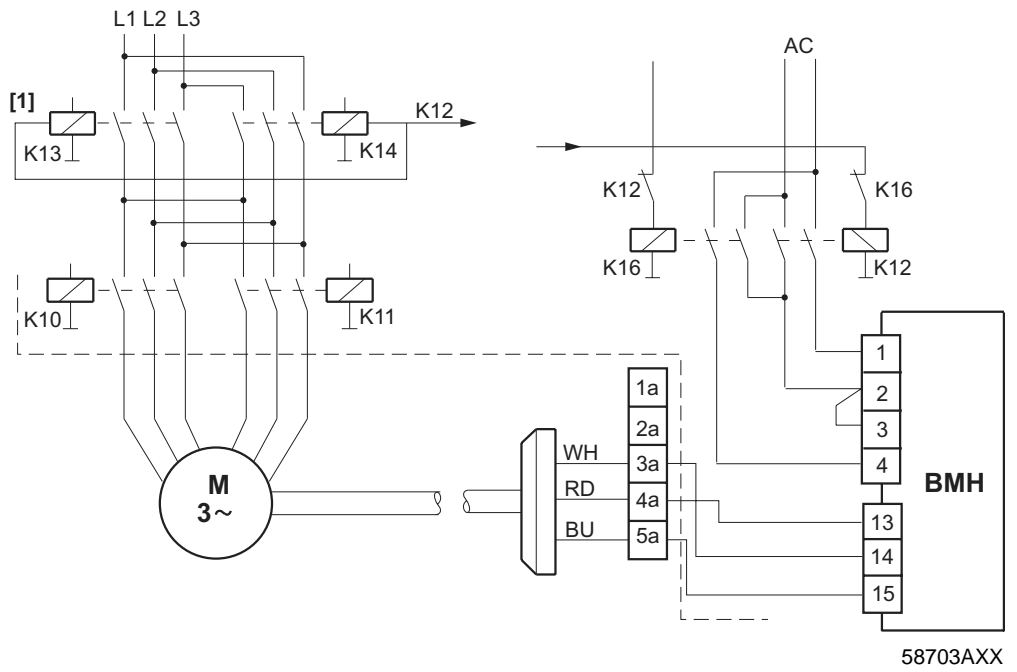
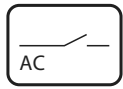
11.3.3 BMS, BME, BMP in control cabinet, pole-changing motor (separate winding)



[1] K12 is connected at the same time as K13 or K14 (direction of rotation).
 [2] Change jumper or NO contact from 3 to 4 if connection is only to be in the AC circuit



11.3.4 BMH in control cabinet, pole-changing motor (separate winding)



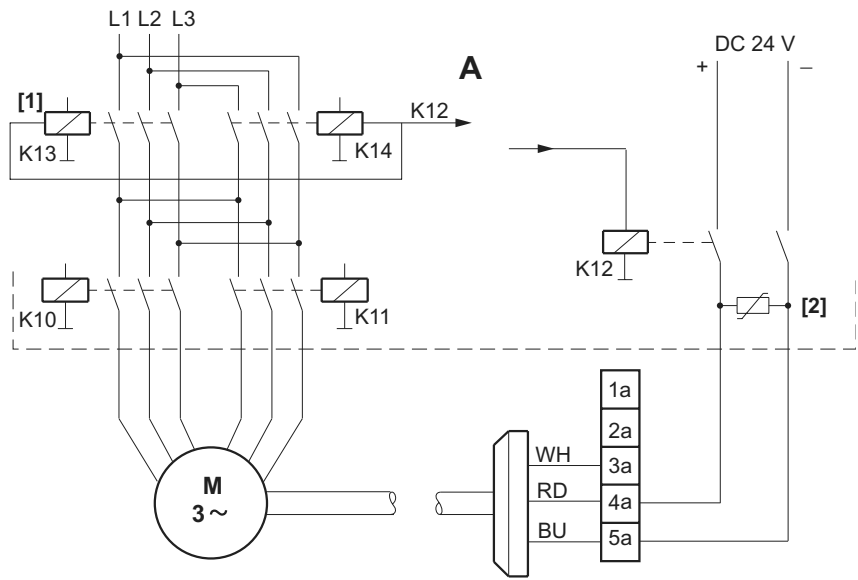
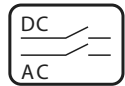
[1] K12 is connected at the same time as K13 or K14 (direction of rotation).

[2] K16 must be triggered to heat the brake. K16 is locked with K12. Only heat during lengthy breaks.

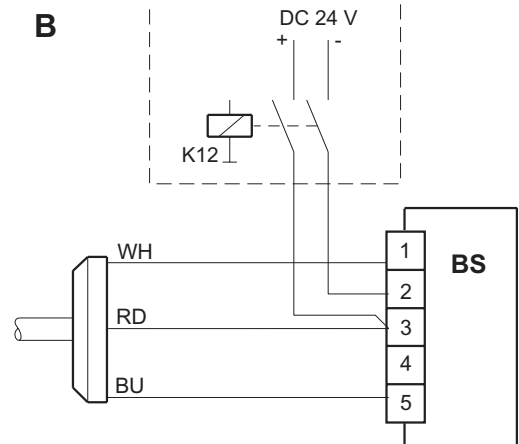
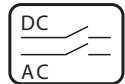


Sample circuits
Pole-changing motors

11.3.5 Brake control system DC 24 V, pole-changing motor (separate winding)

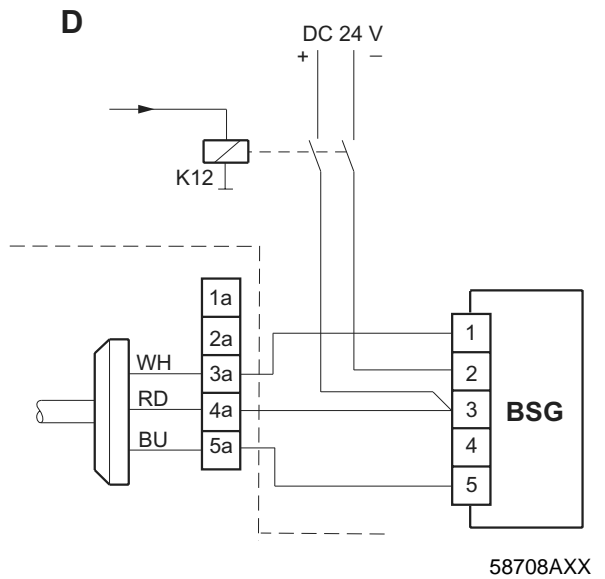
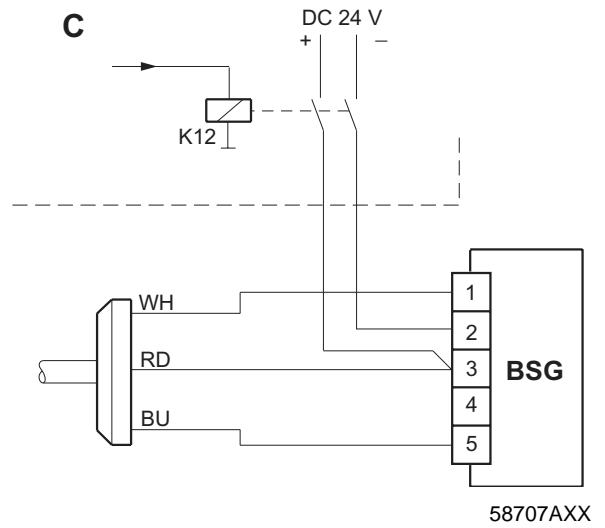
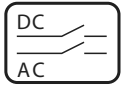
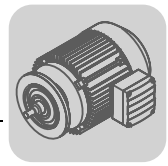


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- A Standard for brake motor size 63 with DC 24 V brake
- B Standard for brake motor sizes 71 to 100 with BS in terminal box
- [1] K12 is connected at the same time as K13 or K14 (direction of rotation)
- [2] Protection circuit against switching overvoltages to be installed by the customer

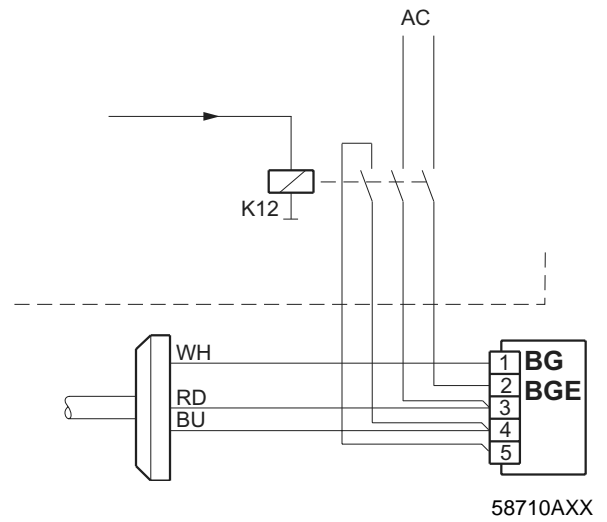
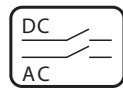
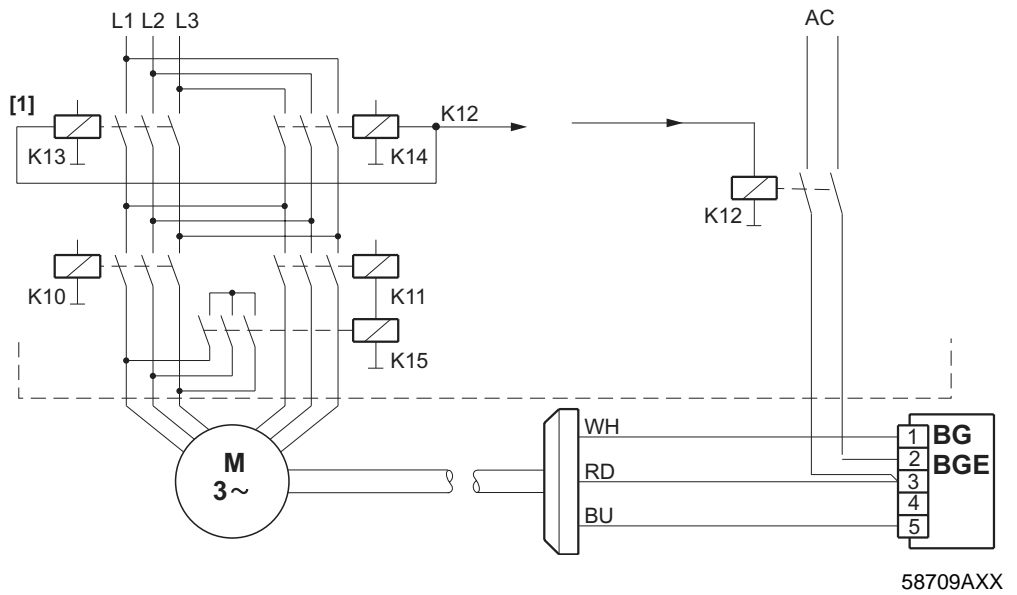
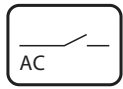


- C Standard for brake motor sizes 112 to 225 with BSG in terminal box
E For brake motor sizes 71 to 225 with BSG in control cabinet



Sample circuits
Pole-changing motors

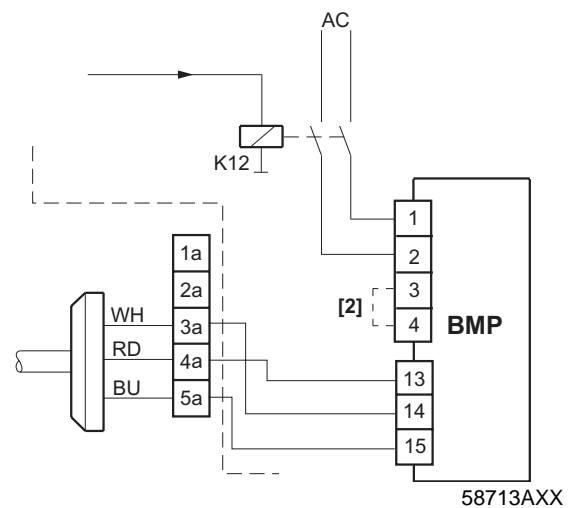
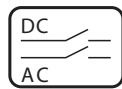
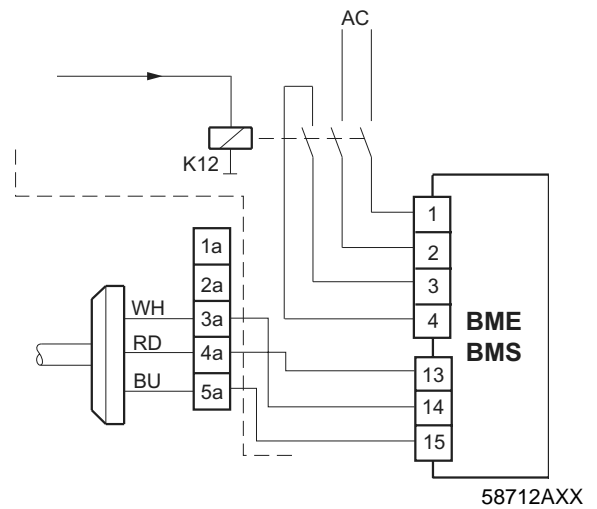
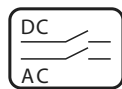
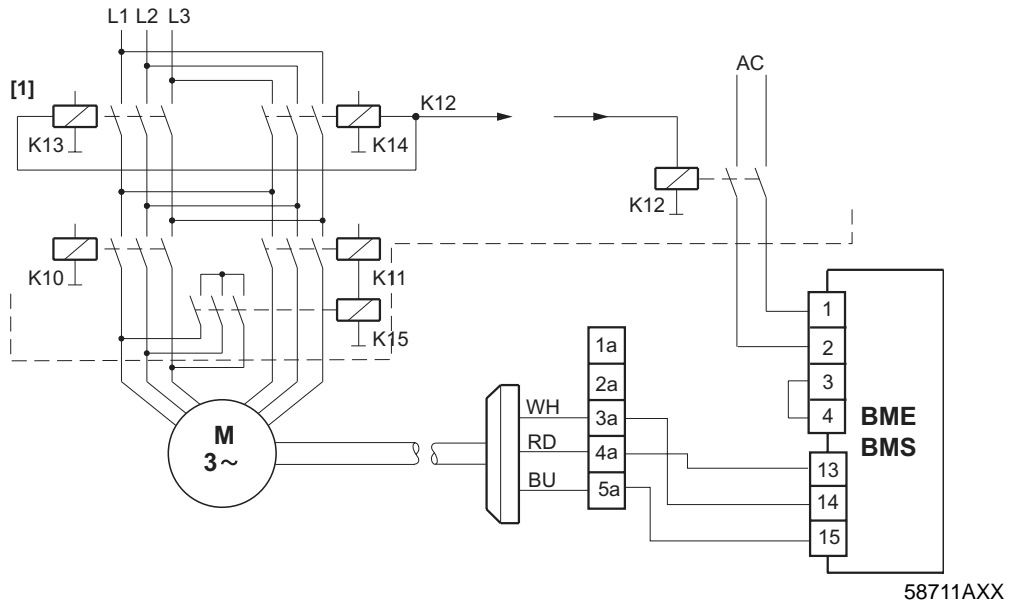
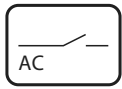
11.3.6 BG, BGE in terminal box, pole-changing motor (Dahlander)



[1] K12 is connected at the same time as K13 or K14 (direction of rotation).



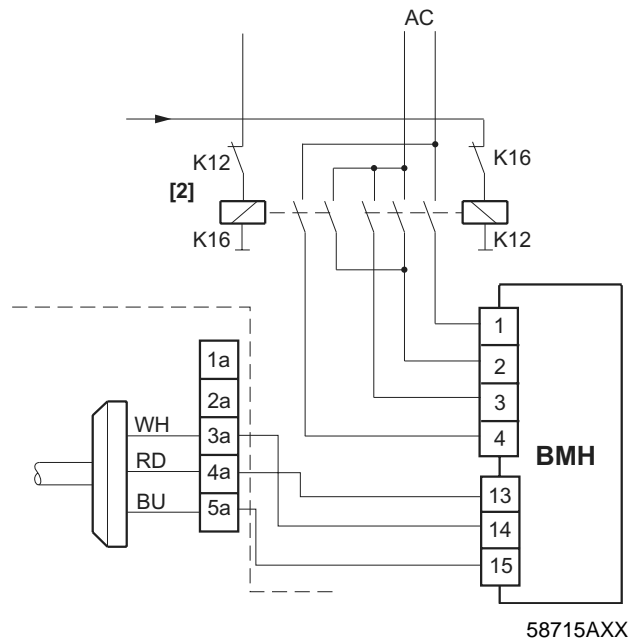
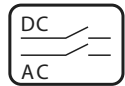
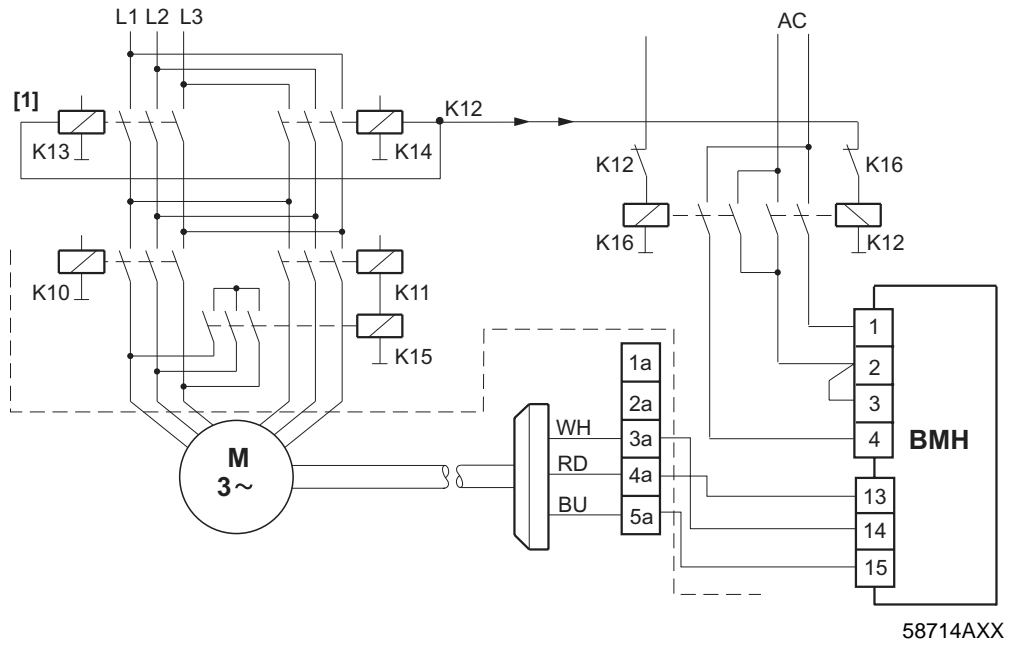
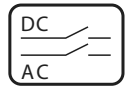
11.3.7 BMS, BME, BMP in control cabinet, pole-changing motor (Dahlander)



- [1] K12 is connected at the same time as K13 or K14 (direction of rotation).
- [2] Change jumper or NO contact from 3 to 4 if connection is only to be in the AC circuit.



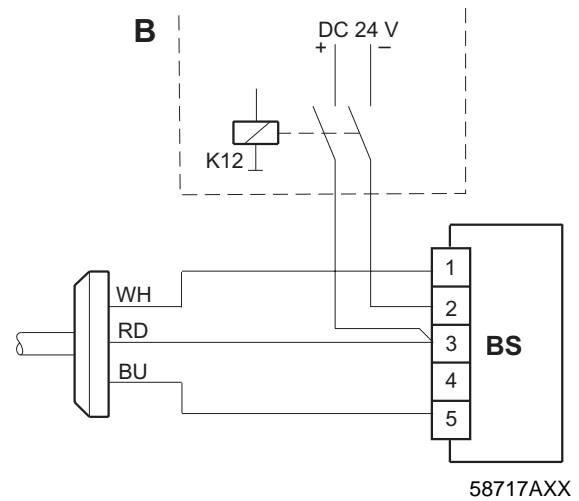
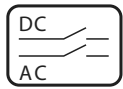
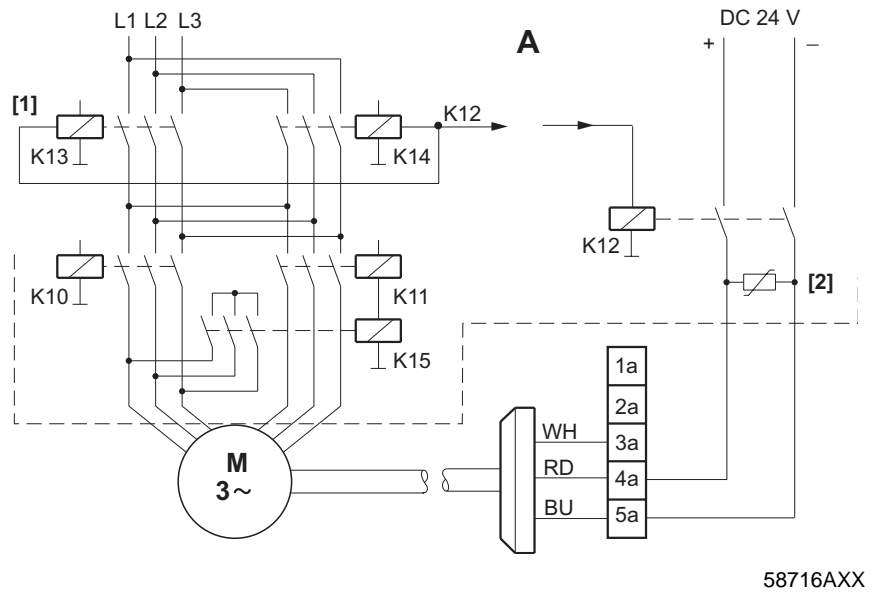
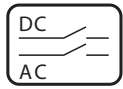
11.3.8 BMH in control cabinet, pole-changing motor (Dahlander)



- [1] K12 is connected at the same time as K13 or K14 (direction of rotation).
- [2] K16 must be triggered to heat the brake. K16 is locked with K12. Only heat during lengthy breaks.



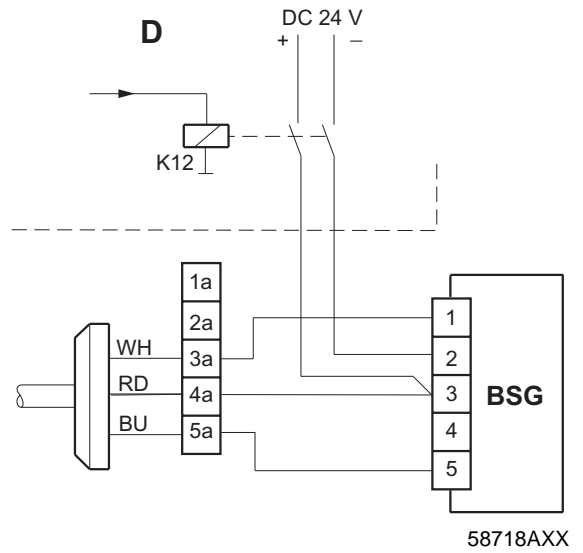
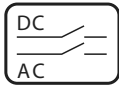
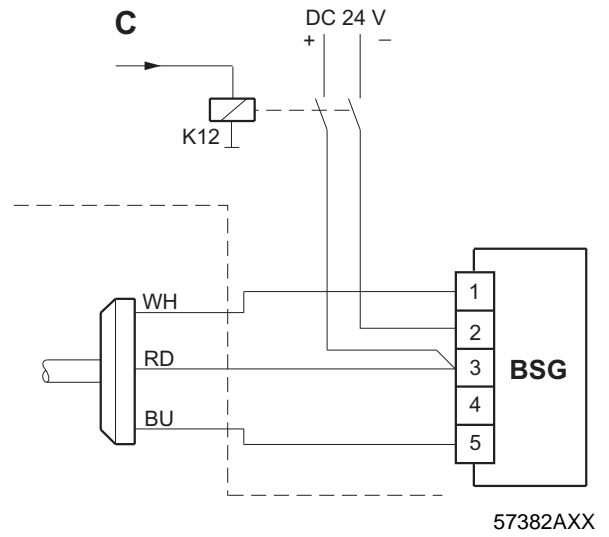
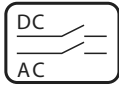
11.3.9 Brake control system DC 24 V, pole-changing motor (Dahlander)



- A Standard for brake motor size 63 with DC 24 V brake
- B Standard for brake motor sizes 71 to 100 with BS in terminal box
- [1] K12 is connected at the same time as K13 or K14 (direction of rotation)
- [2] Protection circuit against switching overvoltages to be installed by the customer



Sample circuits
Pole-changing motors

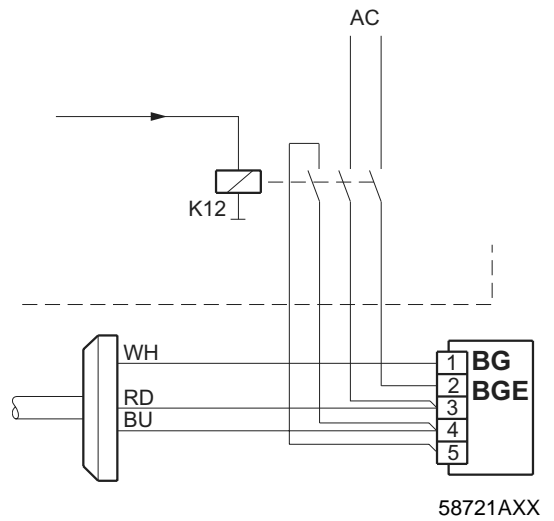
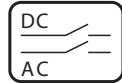
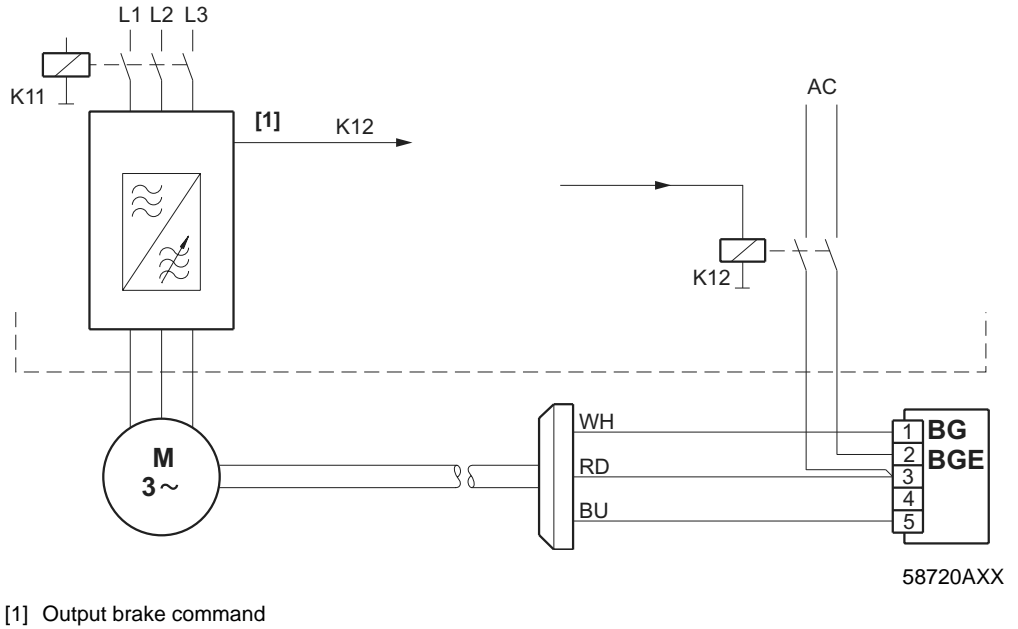
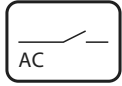


- C Standard for brake motor sizes 112 to 225 with BSG in terminal box
- E For brake motor sizes 71 to 225 with BSG in control cabinet



11.4 AC motors with frequency inverter

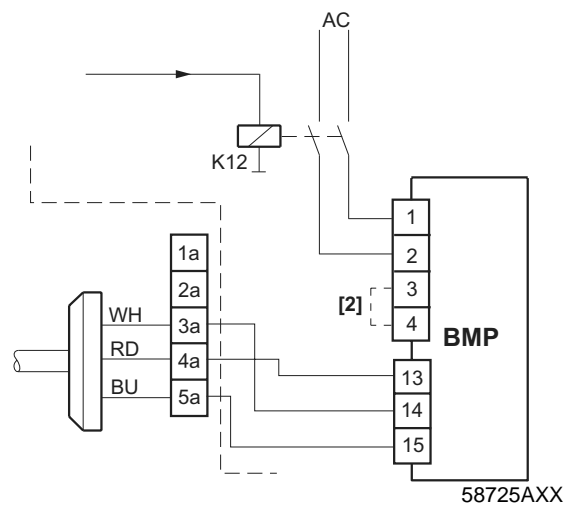
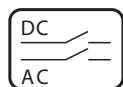
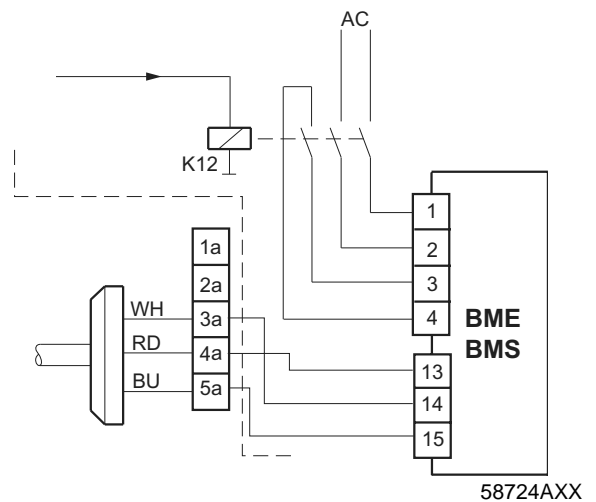
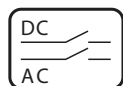
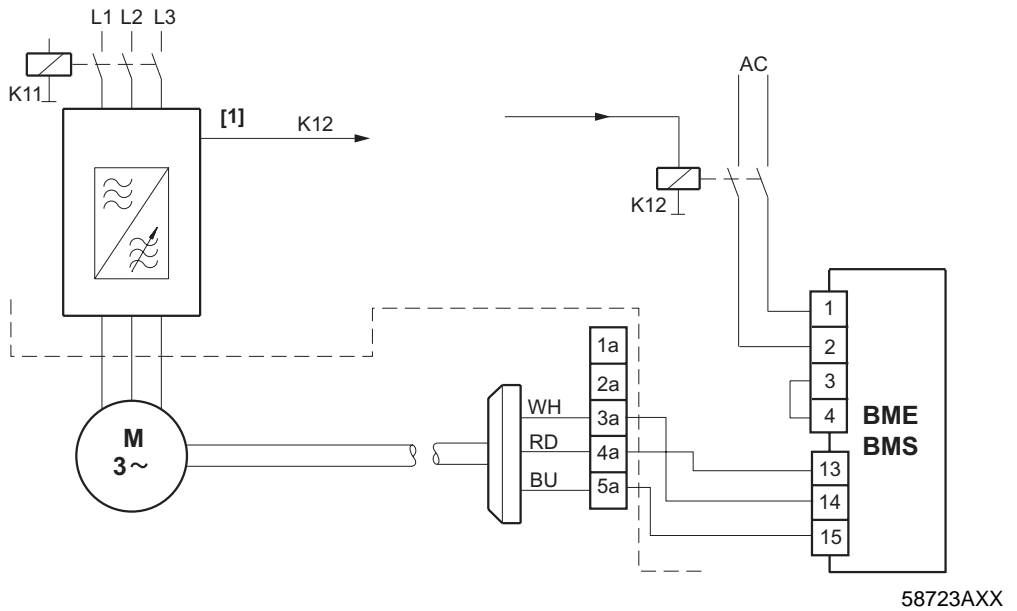
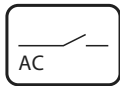
11.4.1 BG, BGE in terminal box, AC motor with frequency inverter



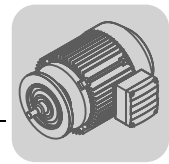


Sample circuits
AC motors with frequency inverter

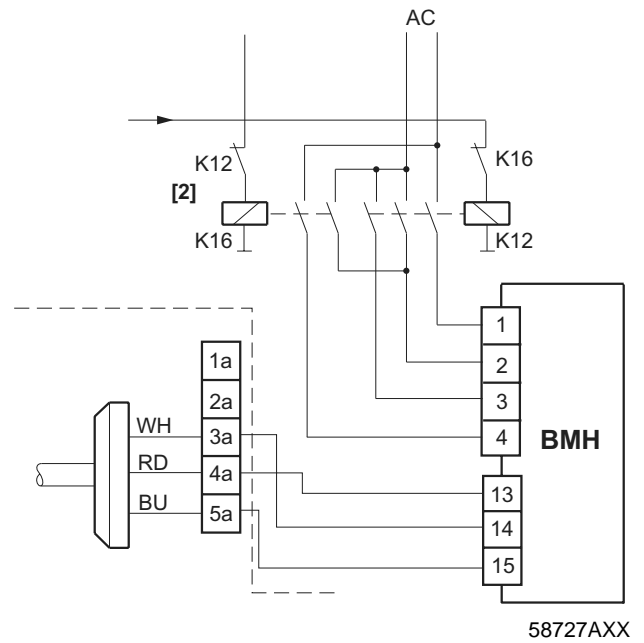
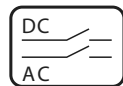
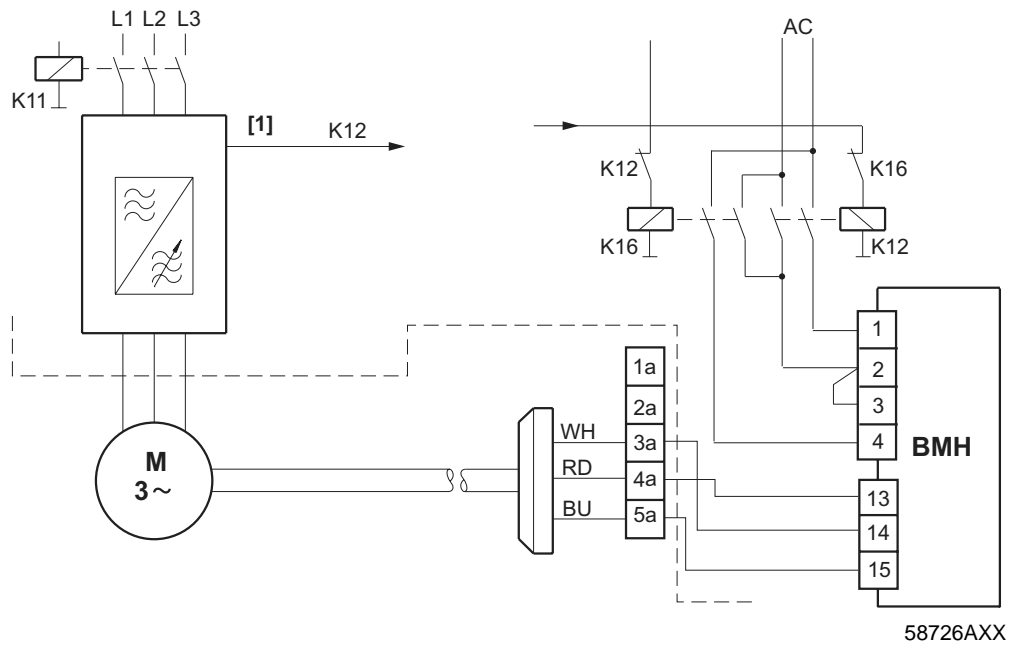
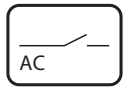
11.4.2 BMS, BME, BMP in control cabinet, AC motor with frequency inverter



- [1] Output brake command
- [2] Change jumper or NO contact from 3 to 4 if connection is only to be in the AC circuit.



11.4.3 BMH in control cabinet, AC motor with frequency inverter



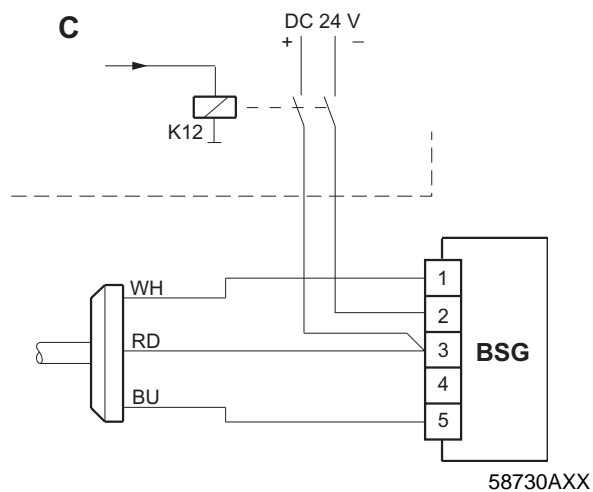
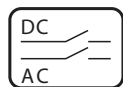
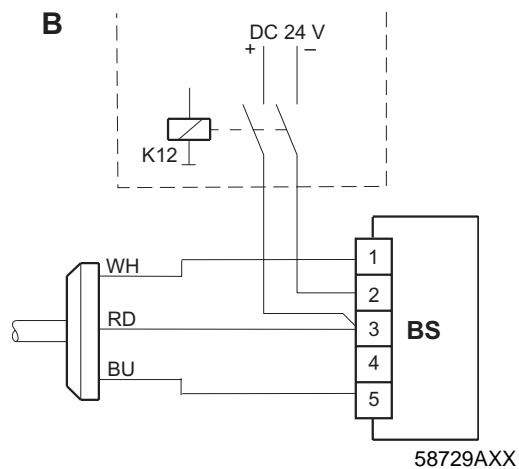
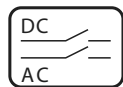
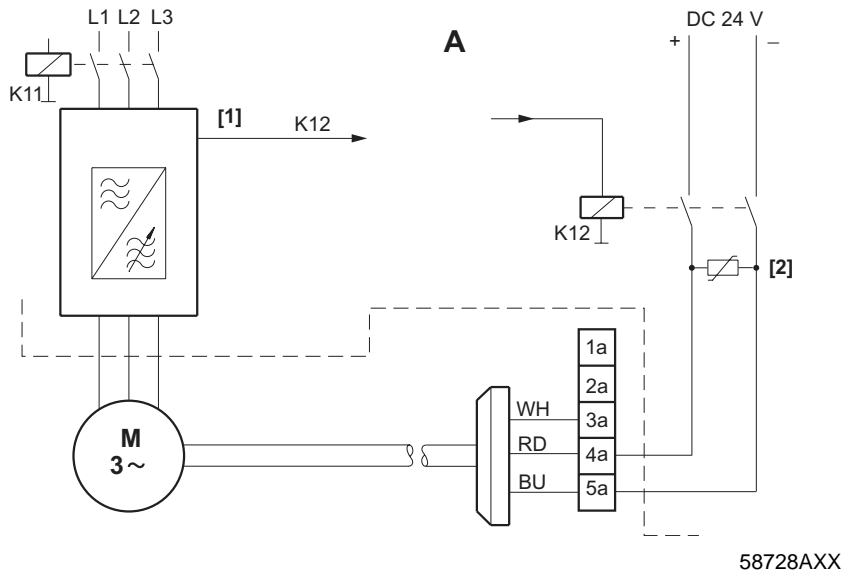
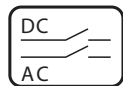
[1] Output brake command

[2] K16 must be triggered to heat the brake. K16 is locked with K12. Only heat during lengthy breaks.

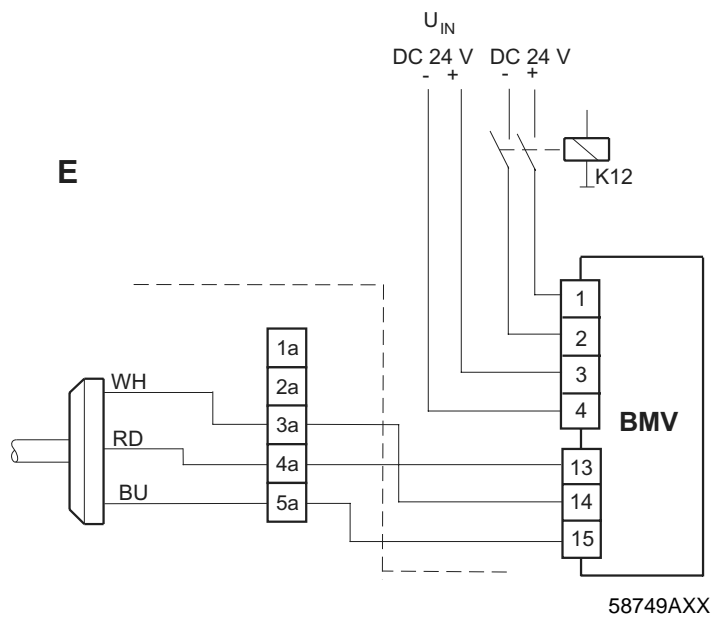
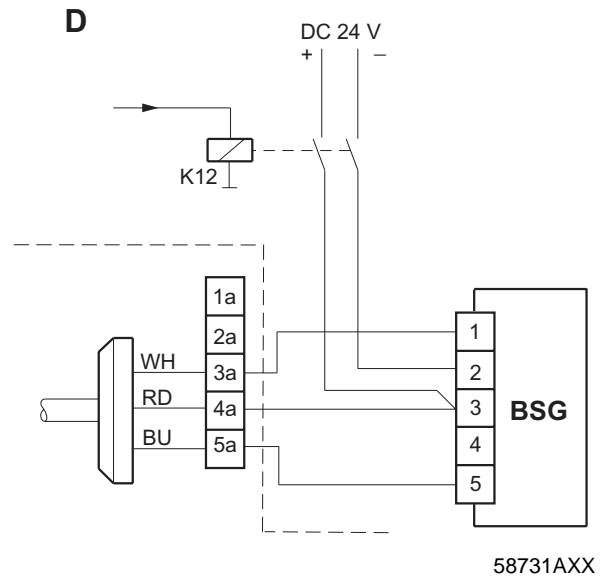
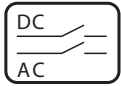


Sample circuits
AC motors with frequency inverter

11.4.4 Brake control system DC 24 V, AC motor with frequency inverter



- A Standard for brake motor size 63 with DC 24 V brake
- B Standard for brake motor sizes 71 to 100 with BS in terminal box
- C Standard for brake motor sizes 112 to 225 with BSG in terminal box
- [1] K12 is switched by the brake output
- [2] Protection circuit against switching overvoltages to be installed by the customer

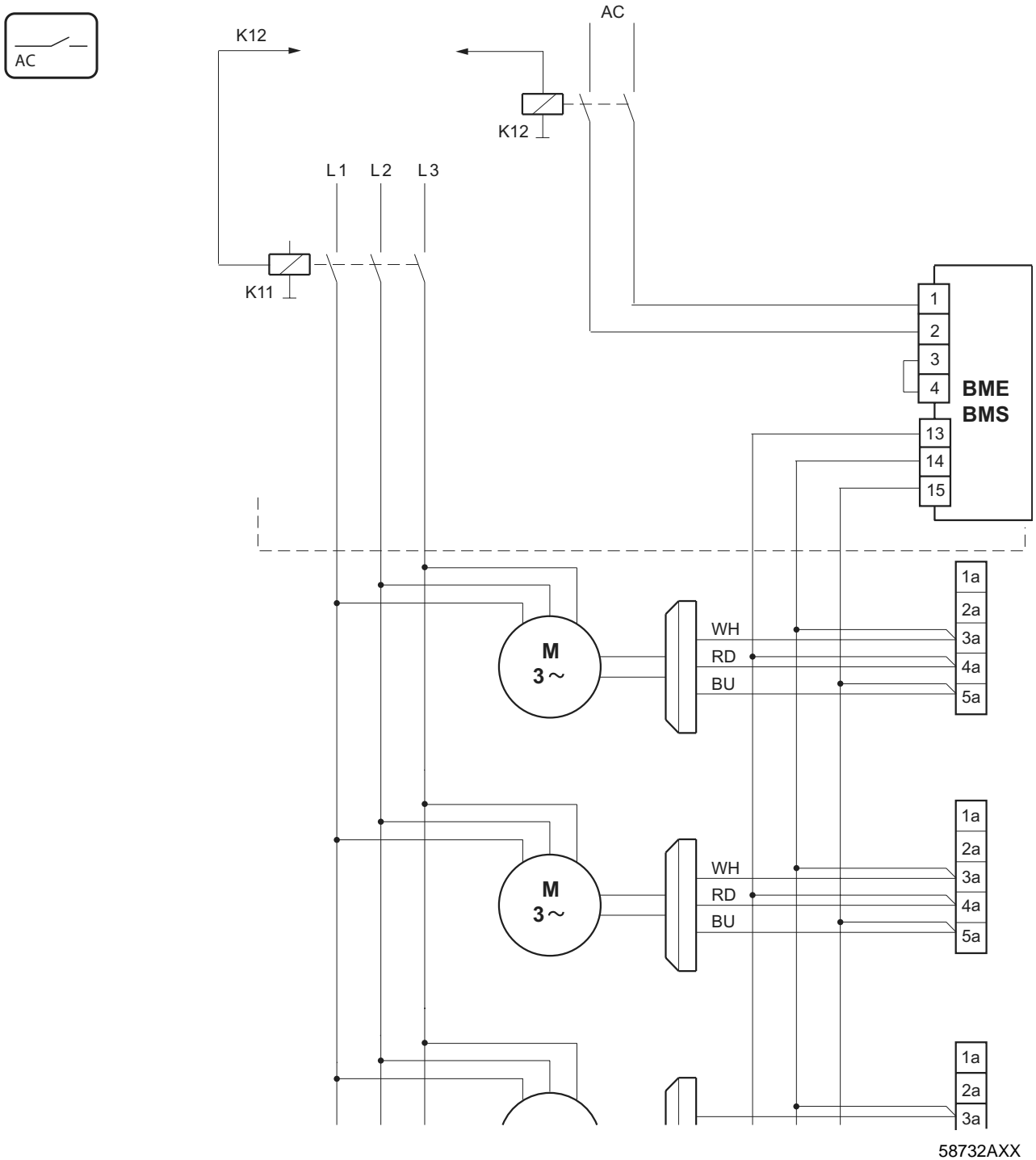


D For brake motor sizes 71 to 225 with BSG in control cabinet
E For brake motor sizes 71 to 225 with BMV in control cabinet
 U_{IN} = Control signal

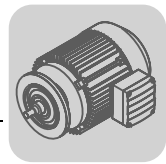


11.5 Multi-motor operation

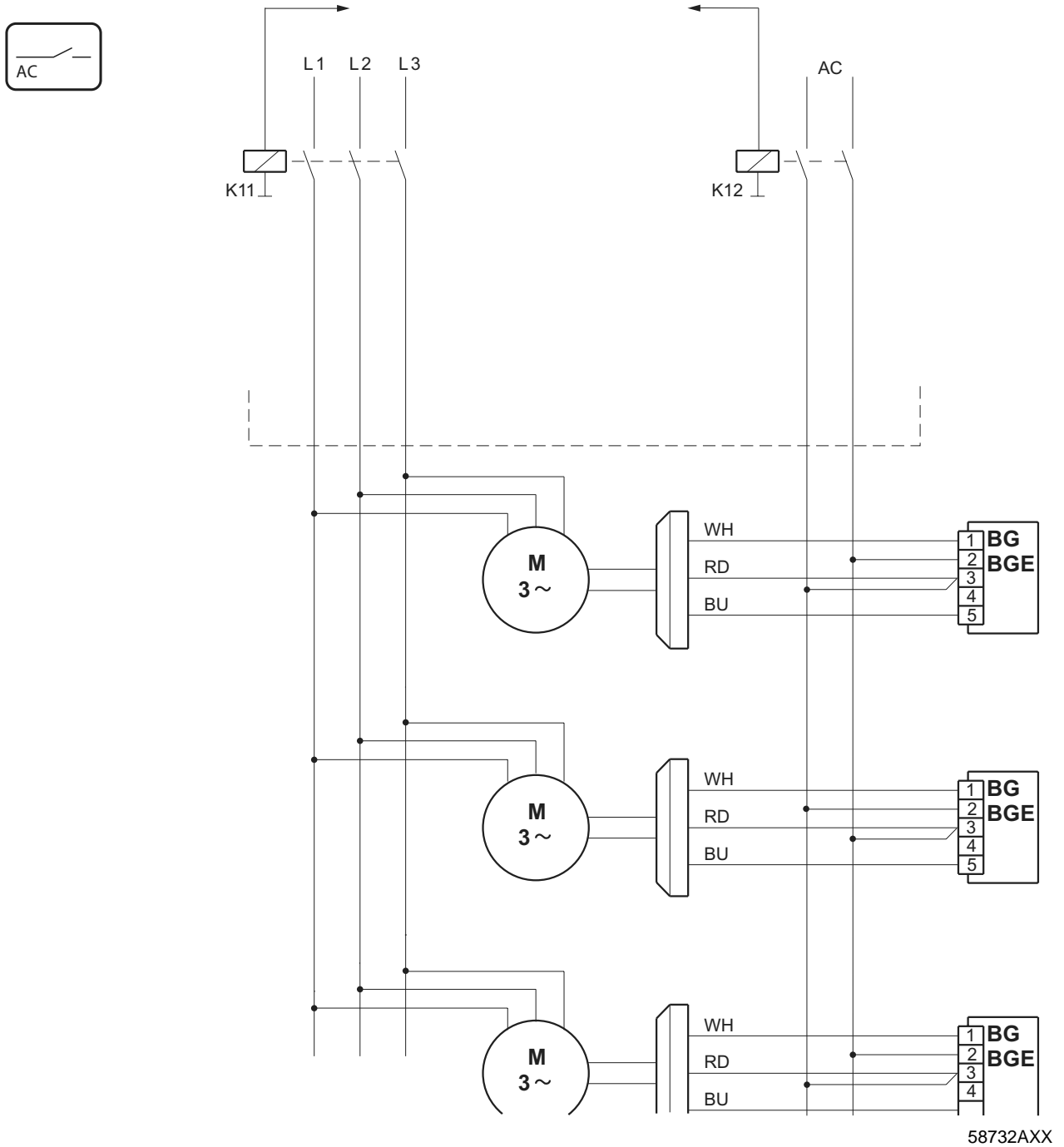
11.5.1 Parallel connection of several brakes to BMS, BME in the control cabinet



The total of the brake currents must not exceed the maximum permitted current of the brake control unit.

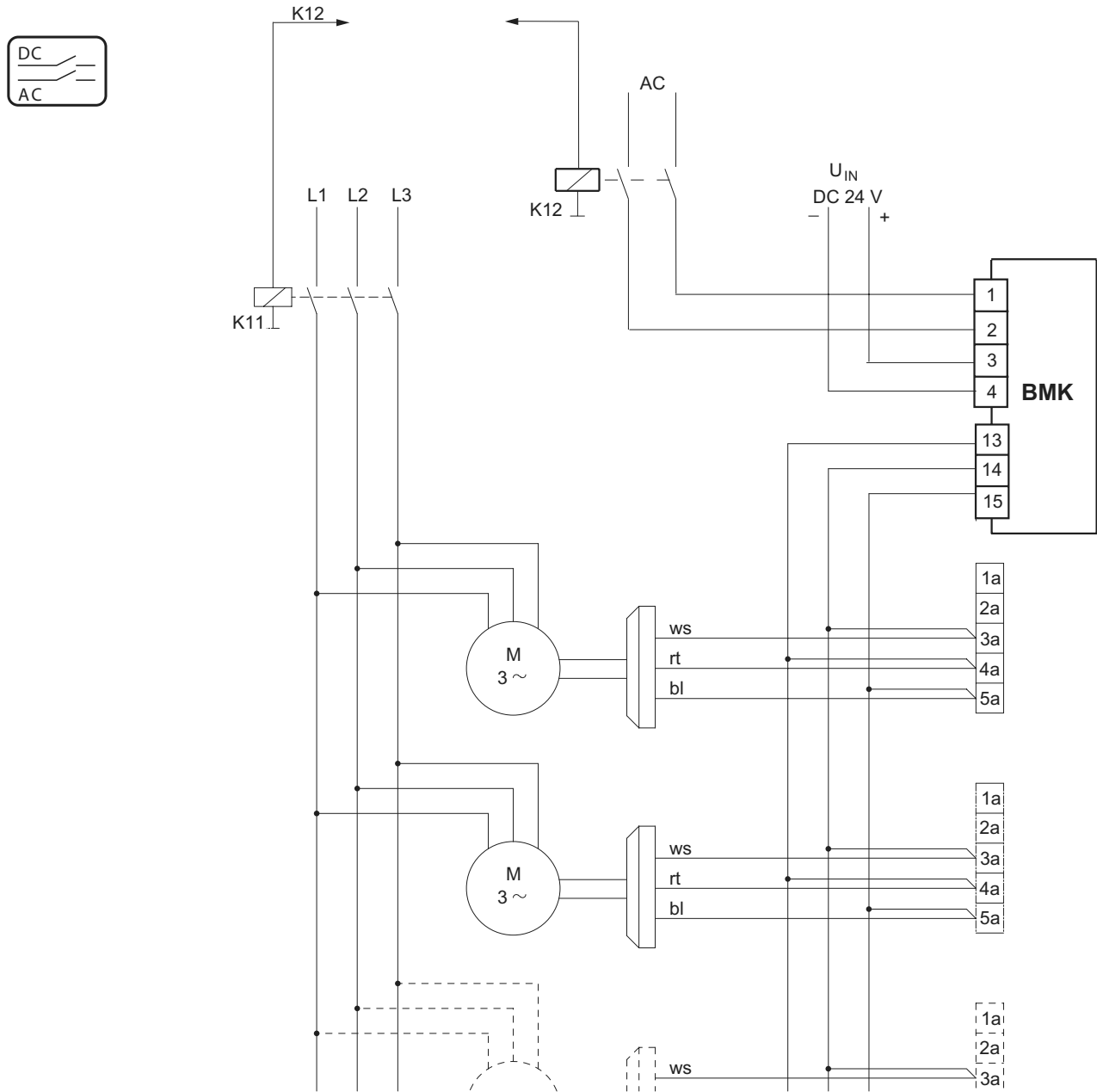


11.5.2 Inverse-parallel connection of several BGs, BGEs in the terminal box to jointly switched supply voltage





11.5.3 Parallel connection of several brakes to BMK in the control cabinet

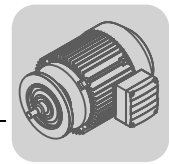


56589AXX

U_{IN} = Control signal



The total of the brake currents must not exceed the maximum permitted current of the brake control unit.



12 Technical Data

12.1 Technical data for the BR/BM(G) brake for AC motors, asynchronous servomotors

The following table lists the technical data of the brakes. The type and number of brake springs determines the level of the braking torque. Maximum braking torque $M_{B \max}$ is installed as standard, unless specified otherwise in the order. Other brake spring combinations can result in reduced braking torque values $M_{B \text{ red}}$.

Brake Type	For motor size	$M_{B \max}$ [Nm]	Reduced braking torques $M_{B \text{ red}}$ [Nm]							W [10^6 J]	t_1 [10^{-3} s]	t_2		P_B [W]
												t_{2I} [10^{-3} s]	t_{2II} [10^{-3} s]	
BMG02	DT56	1.2	0.8							15	28	10	100	25
BR03	DR63	3.2	2.4	1.6	0.8					200	25	3	30	26
BMG05	DT71/80	5.0	4	2.5	1.6	1.2				120	30 20 ¹⁾	5	35	32
BMG1	DT80	10	7.5	6						120	50 20 ¹⁾	8	40	36
BMG2	DT90/DV100	20	16	10	6.6	5				260	70 30 ¹⁾	12	80	40
BMG4	DV100	40	30	24						260	130 35 ¹⁾	15	80	50
BMG8	DV112M	55	45	37	30	19	12.6	9.5		600	30	12	60	70
	DV132S	75	55	45	37	30	19	12.6	9.5	600	35	10	50	70
BM15	DV132M	100	75	50	35	25				1000	40	14	70	95
	DV132ML/DV160M	150	125	100	75	50	35	25		1000	50	12	50	95
BM30	DV160L	200	150	125	100	75	50			1500	55	18	90	120
	DV180M/L	300	250	200	150	125	100	75	50	1500	60	16	80	120
BM31	DV200/225	300	250	200	150	125	100	75	50	1500	60	16	80	120
BM32 ²⁾	DV180M/L	300	250	200	150	100				1500	55	18	90	120
BM62 ²⁾	DV200/225	600	500	400	300	250	200	150	100	1500	60	16	80	120
BMG61	DV250/280	600	500	400	300	200				2500	90	25	120	195
BMG122 ²⁾	DV250/280	1200	1000	800	600	400				2500	90	25	120	195

1) For operation with brake control system BGE/BME

2) Double disc brake

- $M_{B \max}$ Maximum braking torque
- $M_{B \text{ red}}$ Reduced braking torque
- W Braking work until maintenance
- t_1 Response time
- t_{2I} Brake application time for cut-off in the AC circuit
- t_{2II} Brake application time for cut-off in the DC and AC circuits
- P_B Braking power

The response and application times are recommended values in relation to the maximum braking torque.



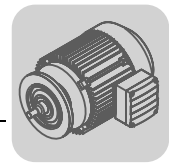
12.2 Technical data for BC brake for explosion-proof AC motors

Brake	For motor size	$M_{B \max}$ [Nm]	Reduced braking torques $M_{B \text{ red}}$ [Nm]						$W^{1)}$ [10^6 J]	t_1 [10^{-3} s]	t_2		P_B [W]
			6	5	4	2.5	1.6	1.2			$t_2^{II(2)}$ [10^{-3} s]	$t_2^{I(3)}$ [10^{-3} s]	
BC 05	eDT71/80	7.5	6	5	4	2.5	1.6	1.2	60	20	8	40	29
BC 2	eDT90/100	30	24	20	16	10	6.6	5	130	35	15	80	41

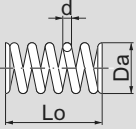
- 1) Work done by brake until maintenance
- 2) Application time with cut-off in the AC and DC circuits
- 3) Application time with cut-off in the AC circuit

$M_{B \max}$	Maximum braking torque
$M_{B \text{ red}}$	Reduced braking torque
W	Braking work until maintenance
t_1	Response time
t_2^I	Brake application time for cut-off in the AC circuit
t_2^{II}	Brake application time for cut-off in the DC and AC circuits
P_B	Braking power

The response and application times are recommended values in relation to the maximum braking torque.



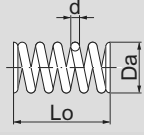
12.3 Table for setting different braking torques for type BMG/BM/BR03/BC

Brake	Mounting on motor	Braking torque [Nm]	Number and type of brake springs		Part (order) no. and brake spring dimensions									Part no. of brake spring
			Nor- mal	Red	Normal				Part no.	Lo	Da	d	w	
					Lo	Da	d	w						
BR03	DR63	3.2	6	-	32	7	0.9	13.5	01858157	32	7	0.65	13.5	01858734
		2.4	4	2										
		1.6	3	2										
		0.8	-	6										
BMG05	DT71/80	5	3	-	30	7.6	1.3	14	0135017X	31.8	7.6	0.9	14	01350188
		4	2	2										
		2.5	-	6										
		1.6	-	4										
		1.2	-	3										
		0.8	-	2										
BMG1	DT80	10	6	-	30	7.6	1.3	14	0135017X	31.8	7.6	0.9	14	01350188
		7.5	4	2										
		6	3	3										
		5	3	-										
BC05	eDT71/80	7.5	4	2	30	7.6	1.3	14	0135017X	31.8	7.6	0.9	14	01350188
		6	3	3										
		5	3	-										
		4	2	2										
		2.5	-	6										
		1.6	-	4										
		1.2	-	3										
BMG2	DT90/DV100	20	3	-	40.4	9.6	1.9	14	01351508	40.7	9.6	1.4	14	01351516
		16	2	2										
		10	-	6										
		6.6	-	4										
		5	-	3										
BMG4	DV100	40	6	-	40.4	9.6	1.9	14	01351508	40.7	9.6	1.4	14	01351516
		30	4	2										
		24	3	3										
		20	3	-										
BC2	eDT90/100	30	4	2	40.4	9.6	1.9	14	01351508	40.7	9.6	1.4	14	01351516
		24	3	3										
		20	3	-										
		16	2	2										
		10	-	6										
		6.6	-	4										
		5	-	3										



Technical Data

Table for setting different braking torques for type BMG/BM/BR03/BC

Brake	Mounting on motor	Braking torque [Nm]	Number and type of brake springs		Part (order) no. and brake spring dimensions									Part no. of brake spring
			Normal	Red	Lo	Da	d	w	Part no.	Lo	Da	d	w	
BMG8	DV112MDV1 32S	75	6	-	46.1	11	2.5	14	01848453	48	11	1.8	15	01355708
		55	4	2										
		45	3	3										
		37	3	-										
		30	2	2										
		19	-	6										
		12.6	-	4										
		9.5	-	3										
BM15	DV132MDV 132MLDV16 0M	150	6	-	52	14.3	3.2	12	01844865	56.6	14.3	2.4	13	01844873
		125	4	2										
		100	3	3										
		75	3	-										
		50	-	6										
		35	-	4										
		25	-	3										
BM30	DV160L DV180	300	8	-	52	19.2	3.6	10	01874551	51.7	19.2	3.0	11	01874578
		250	6	2										
		200	4	4										
		150	4	-										
		125	2	4										
		100	-	8										
		75	-	6										
		50	-	4										
BM31	DV200 DV225	300	8	-	52	19.2	3.6	10	01874551	51.7	19.2	3.0	11	01874578
		250	6	2										
		200	4	4										
		150	4	-										
		125	2	4										
		100	-	8										
		75	-	6										
		50	-	4										
BM32 ¹⁾	DV180	300	4	-	52	19.2	3.6	10	01874551	51.7	19.2	3.0	11	01874578
		250	2	4										
		200	-	8										
		150	-	6										
		100	-	4										

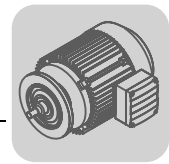
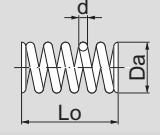


Table for setting different braking torques for type BMG/BM/BR03/BC

Brake	Mounting on motor	Braking torque [Nm]	Number and type of brake springs		Part (order) no. and brake spring dimensions									Part no. of brake spring
			Normal	Red	Normal				Lo	Da	d	w		
					Lo	Da	d	w					Part no.	
BM62 ¹⁾	DV200 DV225	600	8	-	52	19.2	3.6	10	01874551	51.7	19.2	3.0	11	01874578
		500	6	2										
		400	4	4										
		300	4	-										
		250	2	4										
		200	-	8										
		150	-	6										
		100	-	4										
BMG61	DV250 DV280	600	8	-	59.7	24	4.8	8	01868381	59.5	24	4.0	9.5	0186839x
		500	6	2										
		400	4	4										
		300	4	-										
		200	-	8										
BMG122 ¹⁾	DV250 DV280	1200	8	-	59.7	24	4.8	8	01868381	59.5	24	4.0	9.5	0186839x
		1000	6	2										
		800	4	4										
		600	4	-										
		400	-	8										

1) Double disc brake



Technical Data

Technical data for the B / BR brake for synchronous servomotors

12.4 Technical data for the B / BR brake for synchronous servomotors

The following table shows the technical data of SEW brakes. The type and number of brake springs determines the level of the braking torque. Maximum braking torque M_{B1} is installed as standard, unless specified otherwise in the order.

Motor type	M_{B1} [Nm]	M_{B2} [Nm]	W [10 ⁶ J]	t_1 [10 ⁻³ s]	t_{2II} [10 ⁻³ s]	t_{2I} [10 ⁻³ s]
DS56M /B	2.5	–	–	7	–	5
DS56L /B	2.5	–	–	7	–	5
DS56H /B	5	–	–	8	–	5
CM71S /BR	10	5	60	20	40	100
CM71M /BR	14	7	60	25	30	90
CM71L /BR	14	10	60	30	20	90
CM90S /BR	28	14	90	30	35	120
CM90M /BR	40	20	90	35	25	90
CM90L /BR	40	28	90	40	25	90
CM112S /BR	55	28	180	35	35	100
CM112M /BR	90	40	180	40	25	80
CM112L /BR	90	55	180	40	25	80
CM112H /BR	90	50	180	40	25	80

M_{B1} Maximum braking torque

M_{B2} Reduced braking torque

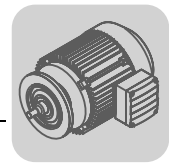
W Braking work until maintenance

t_1 Response time

t_{2II} Brake application time for cut-off in the DC and AC circuits

t_{2I} Brake application time for cut-off in the AC circuit (with DS56 cut-off in the DC circuit)

The response and application times are recommended values in relation to the maximum braking torque.



12.5 Operating currents for brakes

The following tables list the operating currents of the brakes at different voltages. The following values are specified:

- Inrush current ratio I_B/I_H ; I_B = accelerator current, I_H = holding current
- Holding current I_H
- Direct current I_G for direct DC voltage supply
- Rated voltage U_N (rated voltage range)

The accelerator current I_B (= inrush current) only flows for a short time (ca. 150 ms) when the brake is released. When the BG brake control system or direct DC voltage supply is used (only possible to motor size 100), increased inrush current does not occur.

The values for the holding currents I_H are r.m.s. values.

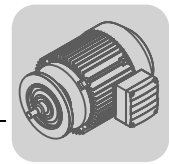


12.5.1 BMG02, BR03

	BMG02	BR03
Motor size	DT56	DR63
Max. braking torque [Nm]	1.2	3.2
Coil power [W]	25	26
Inrush current ratio I_B/I_H	-	4

Rated voltage U_N		BMG02		BR03	
AC V	DC V	I_H [AC A]	I_G [DC A]	I_H [AC A]	I_G [DC A]
	24	-	0.72	-	0.95
24 (23-26)	10	-	-	1.96	2.47
42 (40-45)	18	-	-	1.06	1.34
48 (46-50)	20	-	-	0.94	1.18
53 (51-56)	22	-	-	0.84	1.06
60 (57-63)	24	-	-	0.75	0.95
67 (64-70)	27	-	-	0.67	0.84
73 (71-78)	30	-	-	0.59	0.74
85 (79-87)	36	-	-	0.53	0.67
92 (88-98)	40	-	-	0.475	0.59
110 (99-110)	44	-	-	0.42	0.53
120 (111-123)	48	-	-	0.375	0.48
133 (124-138)	54	-	-	0.335	0.42
147 (139-154)	60	-	-	0.300	0.38
160 (155-173)	68	-	-	0.265	0.34
184 (174-193)	75	-	-	0.24	0.30
208 (194-217)	85	-	-	0.210	0.26
230 (218-243)	96	0.14	0.18	0.190	0.24
254 (244-273)	110	-	-	0.168	0.21
290 (274-306)	125	-	-	0.149	0.19
318 (307-343)	140	-	-	0.133	0.16
360 (344-379)	150	-	-	0.119	0.15
400 (380-431)	170	0.08	0.10	0.109	0.14
460 (432-500)	190	0.07	0.09	0.094	0.11

- I_B Accelerator current – short-term inrush current
 I_H Holding current r.m.s. value in the supply cable to the SEW brake rectifier
 I_G Direct current for DC voltage supply with rated voltage U_N
 U_N Rated voltage (rated voltage range)



12.5.2 BMG 05 / 1 / 2 / 4

	BMG05	BMG1	BMG2	BMG4
Motor size	DT71/80	DT80	DT90/DV100	DV100
Max. braking torque [Nm]	5	10	20	40
Coil power [W]	32	36	40	50
Inrush current ratio I_B/I_H	4	4	4	4

Rated voltage U_N		BMG05		BMG1		BMG2		BMG4	
AC V	DC V	I_H [AC A]	I_G [DC A]	I_H [AC A]	I_G [DC A]	I_H [AC A]	I_G [DC A]	I_H [AC A]	I_G [DC A]
	24		1.38		1.54		1.77		2.20
24 (23-25)	10	2.0	3.3	2.3	3.7	-	-	-	-
42 (40-46)	18	1.18	1.74	1.26	1.94	1.43	2.25	1.87	2.80
48 (47-52)	20	1.05	1.55	1.13	1.73	1.28	2.00	1.67	2.50
56 (53-58)	24	0.94	1.38	1.00	1.54	1.146	1.77	1.49	2.20
60 (59-66)	27	0.83	1.23	0.89	1.37	1.01	1.58	1.33	2.00
73 (67-73)	30	0.74	1.10	0.80	1.23	0.90	1.41	1.18	1.76
77 (74-82)	33	0.66	0.98	0.71	1.09	0.80	1.25	1.05	1.57
88 (83-92)	36	0.59	0.87	0.63	0.97	0.72	1.12	0.94	1.40
97 (93-104)	40	0.53	0.78	0.56	0.87	0.64	1.00	0.84	1.25
110 (105-116)	48	0.47	0.69	0.50	0.77	0.57	0.90	0.752	1.11
125 (117-131)	52	0.42	0.62	0.45	0.69	0.51	0.80	0.66	1.00
139 (132-147)	60	0.37	0.55	0.400	0.61	0.450	0.70	0.59	0.88
153 (148-164)	66	0.33	0.49	0.355	0.55	0.405	0.63	0.53	0.79
175 (165-185)	72	0.30	0.44	0.32	0.49	0.36	0.56	0.47	0.70
200 (186-207)	80	0.265	0.39	0.28	0.43	0.32	0.50	0.42	0.62
230 (208-233)	96	0.235	0.35	0.25	0.39	0.285	0.44	0.375	0.56
240 (234-261)	110	0.210	0.31	0.225	0.35	0.255	0.40	0.335	0.50
290 (262-293)	117	0.187	0.28	0.200	0.31	0.23	0.35	0.300	0.44
318 (294-329)	125	0.166	0.25	0.178	0.27	0.2	0.31	0.265	0.39
346 (330-369)	147	0.148	0.22	0.159	0.24	0.18	0.28	0.235	0.35
400 (370-414)	167	0.132	0.20	0.142	0.22	0.161	0.25	0.210	0.31
440 (415-464)	185	0.118	0.17	0.126	0.19	0.143	0.22	0.187	0.28
500 (465-522)	208	0.105	0.15	0.113	0.17	0.128	0.20	0.167	0.25
575 (523-585)	233	0.094	0.14	0.10	0.15	0.114	0.17	0.149	0.22

- I_B Accelerator current – short-term inrush current
- I_H Holding current r.m.s. value in the supply cable to the SEW brake rectifier
- I_G Direct current with direct DC voltage supply
- U_N Rated voltage (rated voltage range)



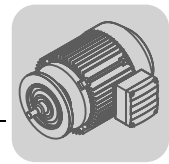
12.5.3 BMG 8, BM 15 / 30 / 31 / 32 / 62

	BMG8	BM15	BM30/31; BM32/62
Motor size	DV112/132S	DV132M-160M	DV160L-225
Max. braking torque [Nm]	75	150	600
Coil power [W]	70	95	120
Inrush current ratio I_B/I_H	6.3	7.5	8.5

Rated voltage U_N		BMG8	BM15	BM30 / 31; BM 32 / 62
AC V	DC V	I_H [AC A]	I_H [AC A]	I_H [AC A]
	24	2.77 ¹⁾	4.15 ¹⁾	4.00 ¹⁾
42 (40-46)	-	2.31	3.35	-
48 (47-52)	-	2.10	2.95	-
56 (53-58)	-	1.84	2.65	-
60 (59-66)	-	1.64	2.35	-
73 (67-73)	-	1.46	2.10	-
77 (74-82)	-	1.30	1.87	-
88 (83-92)	-	1.16	1.67	-
97 (93-104)	-	1.04	1.49	-
110 (105-116)	-	0.93	1.32	1.78
125 (117-131)	-	0.82	1.18	1.60
139 (132-147)	-	0.73	1.05	1.43
153 (148-164)	-	0.66	0.94	1.27
175 (165-185)	-	0.59	0.84	1.13
200 (186-207)	-	0.52	0.74	1.00
230 (208-233)	-	0.46	0.66	0.90
240 (234-261)	-	0.41	0.59	0.80
290 (262-293)	-	0.36	0.53	0.71
318 (294-329)	-	0.33	0.47	0.63
346 (330-369)	-	0.29	0.42	0.57
400 (370-414)	-	0.26	0.37	0.50
440 (415-464)	-	0.24	0.33	0.44
500 (465-522)	-	0.20	0.30	0.40
575 (523-585)	-	0.18	0.26	0.36

1) Direct current for operation with BSG

- I_H Holding current r.m.s. value in the supply cable to the SEW brake rectifier
 I_B Accelerator current – short-term inrush current
 U_N Rated voltage (rated voltage range)



12.5.4 BMG61 / 122

	BMG61	BMG122
Motor size	DV250M...280	
Max. braking torque [Nm]	600	1200
Coil power [W]	195	
Inrush current ratio I_B/I_H	6	

Rated voltage U_N AC V	BMG61/122 I_H [AC A]
208 (194-217)	1.50
230 (218-243)	1.35
254 (244-273)	1.20
290 (274-306)	1.10
318 (307-343)	1.00
360 (344-379)	0.85
400 (380-431)	0.75
460 (432-484)	0.65
500 (485-542)	0.60
575 (543-600)	0.54

- I_B Accelerator current – short-term inrush current
- I_H Holding current r.m.s. value in the supply cable to the SEW brake rectifier
- U_N Rated voltage (rated voltage range)



12.5.5 BR1, BR2, BR8

Brake	B		BR1	BR2	BR8
For motor	DFS56M/L	DFS56H	CFM71	CFM90	CFM112
M_{Bmax} [Nm]	2.5	5	20	40	90
P_B [W]	12	13.4	45	55	75
Inrush current ratio I_B/I_H	–	–	4.0	4.0	6.3
Rated voltage U_N (...) Voltage tolerances				I_H [AC A]	
[AC V]	[DC V]	I [DC A]	I [DC A]	I_H [AC A]	I_H [AC A]
	24 (24-25)	0.5	0.56	1.5	1.7
110 (99-121)		–	–	0.71	0.9
230 (218-243)		–	–	0.31	0.39
400 (380-431)		–	–	0.18	0.22
460 (432-484)		–	–	0.16	0.21

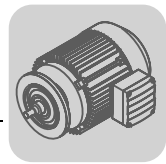
I_H Holding current r.m.s. value in the supply cable to the SEW brake rectifier

I_B Accelerator current – short-term inrush current

I_G Direct current with direct DC voltage supply

U_N Rated voltage (rated voltage range)

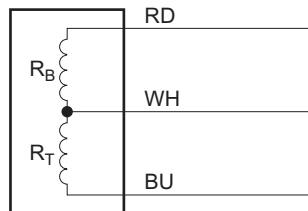
P_B Coil power



12.6 Brake coil resistance

12.6.1 BMG02 / BR03

Brake		BMG02		BR03	
Max. braking torque [Nm]		1.2		3.2	
Coil power [W]		25		26	
Voltage U_N		BS	TS	BS	TS
AC V	DC V	R_B	R_T	R_B	R_T
	24	8.46	24.2	6.0	18.0
24 (23-26)	10			0.95	2.8
42 (40-45)	18			3.0	8.9
60 (57-63)	24			6.0	18.0
110 (99-110)	44			19.0	56.5
120 (111-123)	48			23.9	71.2
133 (124-138)	54			30.1	89.6
208 (194-217)	85			75.6	225
230 (218-243)	96	121	345	95.2	283
254 (244-273)	110			120	357
290 (274-306)	125			151	449
318 (307-343)	140			190	565
360 (344-379)	150			239	712
400 (380-431)	170	374	1070	301	896
460 (432-484)	190			379	1128
500 (485-542)	217	576	1650		



- BS Accelerator coil
- TS Coil section
- R_B Accelerator coil resistance at 20 °C [Ω]
- R_T Coil section resistance at 20 °C [Ω]
- U_N Rated voltage (rated voltage range)
- RD Red
- WH White
- BU Blue

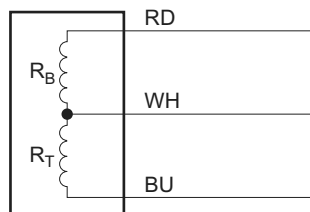


Technical Data

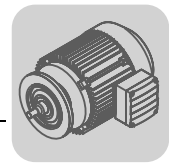
Brake coil resistance

12.6.2 BMG05 / BMG1 / BMG 2 / BMG 4

Brake		BMG05		BMG1		BMG2		BMG4	
Max. braking torque [Nm]		5		10		20		40	
Coil power [W]		32		36		40		50	
Voltage U_N		BS	TS	BS	TS	BS	TS	BS	TS
AC V	DC V	R_B	R_T	R_B	R_T	R_B	R_T	R_B	R_T
	24	4.4	13.4	3.9	12.1	3.4	10.2	2.7	8.2
24 (23-25)	10	0.70	2.14	0.63	1.88	-	-	-	-
42 (40-46)	18	2.8	8.5	2.5	7.6	2.1	6.5	1.7	5.2
48 (47-52)	20	3.5	10.7	3.1	9.6	2.7	8.1	2.2	6.5
56 (53-58)	24	4.4	13.4	3.9	12.1	3.4	10.2	2.7	8.2
110 (105-116)	48	17.6	53.4	15.6	48.1	13.6	40.5	10.9	32.7
125 (117-131)	52	22.1	67.2	19.7	60.6	17.1	51.0	13.7	41.1
139 (132-147)	60	27.9	84.6	24.8	76.2	21.5	64.3	16.9	51.8
175 (165-185)	72	44.2	134	39.3	121	34.1	102	27.4	82.0
200 (186-207)	80	55.6	169	49.5	152	42.9	128	34.5	103
230 (208-233)	96	70.0	213	62.3	192	54.0	161	43.4	130
240 (234-261)	110	88.1	268	78.4	241	68.0	203	54.6	164
290 (262-293)	117	111	337	98.7	304	85.6	256	68.8	206
318 (294-329)	125	140	424	124	382	108	322	86.6	259
346 (330-369)	147	176	534	157	481	136	405	109	327
400 (370- 414)	167	221	672	197	608	171	510	137	411
440 (415-464)	185	279	846	248	762	215	643	173	518
500 (465-522)	208	351	1066	312	960	271	809	218	652
575 (523-585)	233	442	1341	393	1208	341	1018	274	820

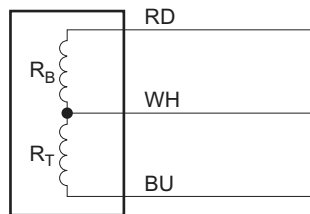


- BS Accelerator coil
- TS Coil section
- R_B Accelerator coil resistance at 20 °C [Ω]
- R_T Coil section resistance at 20 °C [Ω]
- U_N Rated voltage (rated voltage range)
- RD Red
- WH White
- BU Blue



12.6.3 BMG8 / BM15 / BM30 / 31 / 32 / 62

Brake		BMG8		BM15		BM30, 31, 32 / 62	
Max. braking torque [Nm]		75		150		300 / 600	
Coil power [W]		70		95		120	
Voltage U_N		BS	TS	BS	TS	BS	TS
AC V	DC V	R_B	R_T	R_B	R_T	R_B	R_T
	24	1.4	7.5	0.8	5.0	0.67	5.0
42 (40-46)		0.90	4.7	0.5	3.2	-	-
48 (47 ... 52)		1.1	5.9	0.6	4.0	-	-
56 (53-58)		1.4	7.5	0.8	5.0	0.6	4.2
110 (105-116)		5.7	29.8	3.1	20.1	2.2	16.8
125 (117-131)		7.1	37.5	3.9	25.3	2.8	21.1
139 (132-147)		9.0	47.2	4.9	31.8	3.5	26.6
175 (165-185)		14.2	74.8	7.8	50.5	5.6	42.1
200 (186-207)		17.9	94.2	9.8	63.5	7.1	53.0
230 (208-233)		22.5	119	12.4	80.0	8.9	66.7
240 (234-261)		28.3	149	15.6	101	11.2	84.0
290 (262-293)		35.7	188	19.6	127	14.1	106
318 (294-329)		44.9	237	24.7	160	17.8	133
346 (330-369)		56.5	298	31.1	201	22.3	168
400 (370-414)		71.2	375	39.2	253	28.1	211
440 (415-464)		89.6	472	49.3	318	35.4	266
500 (465-522)		113	594	62.1	401	44.6	334
575 (523-585)		142	748	78.2	505	56.1	421

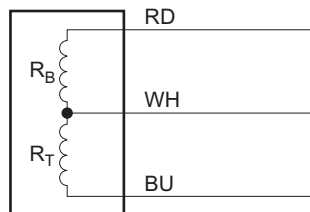


- BS Accelerator coil
- TS Coil section
- R Accelerator coil resistance at 20 °C [Ω]
- R_T Coil section resistance at 20 °C [Ω]
- U_N Rated voltage (rated voltage range)
- RD Red
- WH White
- BU Blue

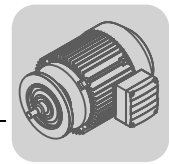


12.6.4 BMG61 / 122

Brake Max. braking torque [Nm] Coil power [W] U_N AC V	BMG61/122 600 / 1200	
	195	
	BS R_B	TS R_T
208 (194-217)	4.0	32.6
230 (218-243)	5.0	41.0
254 (244-273)	6.3	51.6
290 (274-306)	7.9	65
318 (307-343)	10.0	81.8
360 (344-379)	12.6	103
400 (380-431)	15.8	130
460 (432-484)	19.9	163
500 (485-542)	25.1	205
575 (543-600)	31.6	259

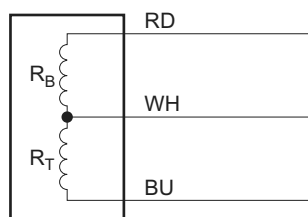


BS Accelerator coil
 TS Coil section
 R_B Accelerator coil resistance at 20 °C [Ω]
 R_T Coil section resistance at 20 °C [Ω]
 U_N Rated voltage (rated voltage range)
 RD Red
 WH White
 BU Blue



12.6.5 BR1 / BR2 / BR8

Brake		BR1		BR2		BR8	
Max. braking torque [Nm]		20		40		90	
Coil power [W]		45		55		75	
Voltage U_N		BS	TS	BS	TS	BS	TS
AC V	DC V	R_B	R_T	R_B	R_T	R_B	R_T
	24	3.7	11.2	3.3	9.8	1.4	7.2
110 (98-110)		11.8	35.4	10.5	31	4.4	22.7
230 (217-242)		59.2	178	52.6	156	21.9	114
400 (385-431)		187	561	158	469	69.3	359
460 (432-484)		236	707	199	590	87.2	452



- BS Accelerator coil
- TS Coil section
- R_B Accelerator coil resistance at 20 °C [Ω]
- R_T Coil section resistance at 20 °C [Ω]
- U_N Rated voltage (rated voltage range)
- RD Red
- WH White
- BU Blue



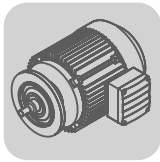
Technical Data

Coil and rectifier data for the BC brake type BC... category 2G/2D (zone

12.7 Coil and rectifier data for the BC brake type BC... category 2G/2D (zone 1/21), protection type delIB/IP65

Brake		BC05		BC2	
For motor size		eDT 71		eDT 90/100	
$M_{B \max}$ [Nm]		7.5		30	
P_B [W]		29		41	
I_B/I_H		4		4	
U_N		I_H [AC A]	I_G [DC A]	I_H [AC A]	I_G [DC A]
AC V	DC V				
200 (186-207)	80	0.24	0.31	0.31	0.44
230 (208-233)	96	0.21	0.27	0.28	0.40
240 (234-261)	110	0.19	0.24	0.25	0.35
290 (262-293)	117	0.17	0.22	0.23	0.32
346 (330-369)	147	0.13	0.18	0.18	0.24
400 (370-414)	167	0.12	0.15	0.15	0.22
440 (415-464)	185	0.11	0.14	0.14	0.20
500 (465-522)	208	0.10	0.12	0.12	0.17

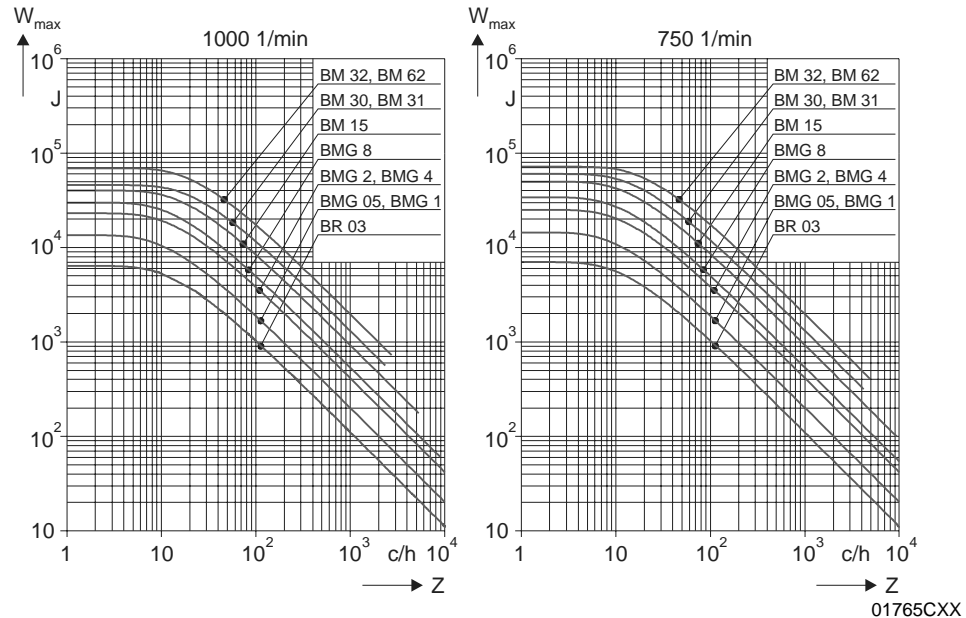
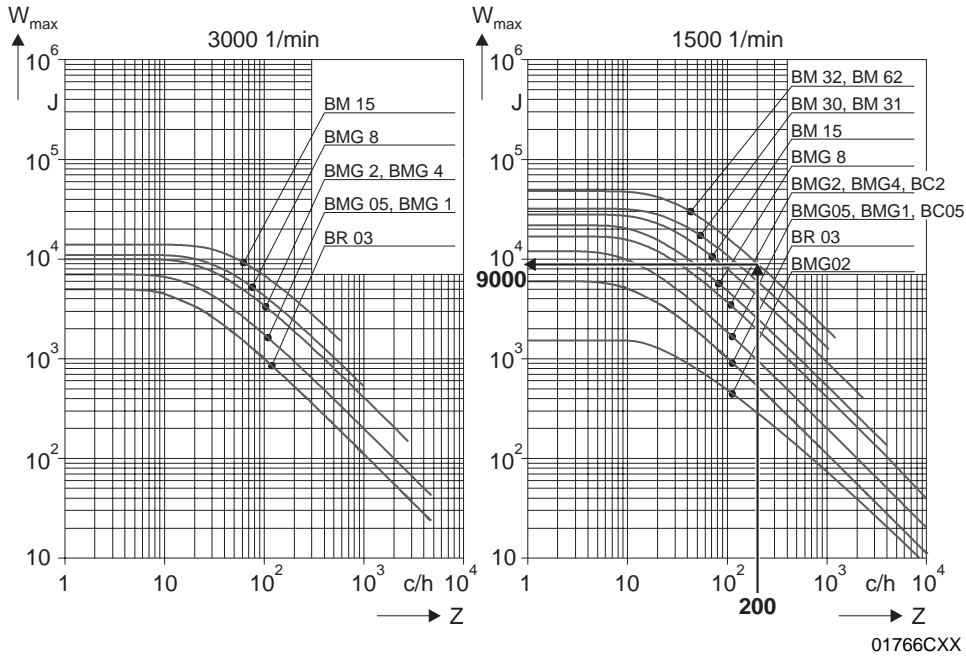
- $M_{B \max}$ Maximum braking torque
 $M_{B \text{ red}}$ Reduced braking torque
 P_B Coil power
 I_H Holding current
 I_G Direct current in the brake coil
 I_B/I_H Inrush current ratio
 U_N Rated voltage (rated voltage range)



12.8 Permitted work done by BM(G), BR for AC motors, asynchronous servomotors

If you are using a brake motor, you have to check whether the brake is approved for use with the required starting frequency Z. The following diagrams show the permitted work done W_max per cycle for different brakes and rated speeds. The values are given with reference to the required starting frequency Z in cycles/hour (1/h).

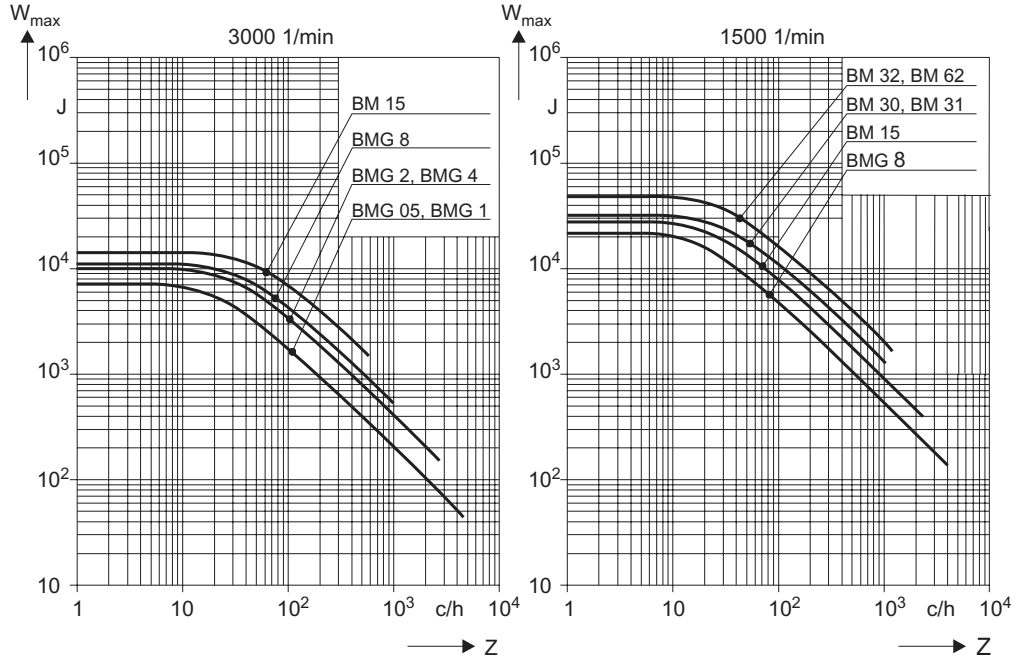
Example: The rated speed is 1500 min^-1 and the brake BM 32 is used. At 200 cycles per hour, the permitted work done per cycle is 9000 J.



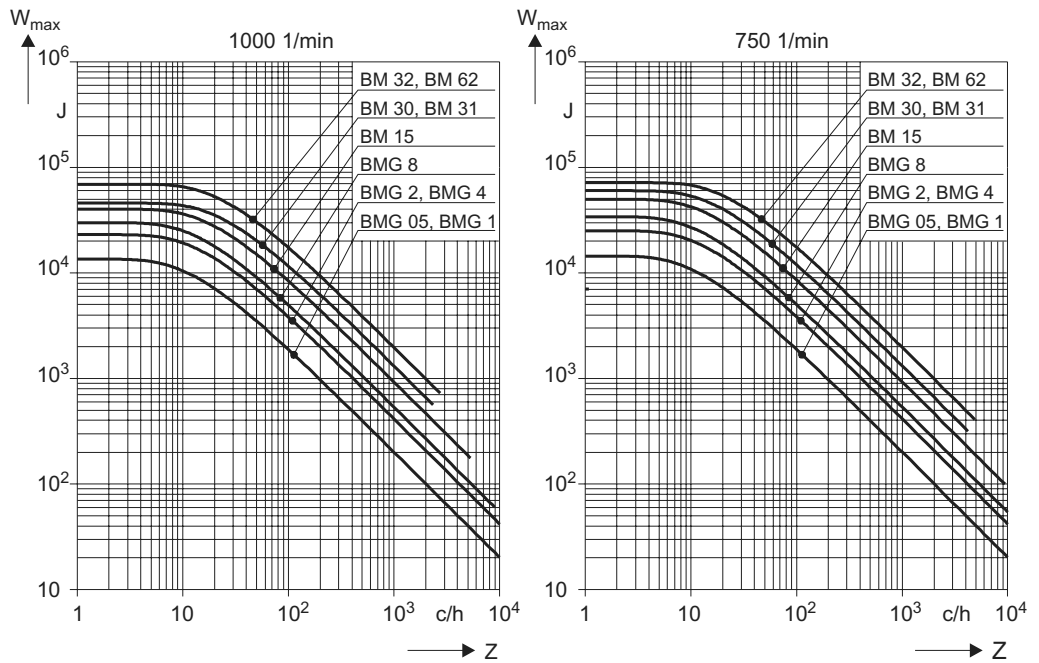
BMG61, BMG122 Contact SEW-EURODRIVE for the values for the permitted work done by the BMG61 and BMG122 brakes.



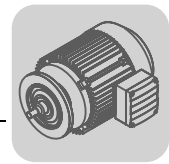
12.9 Permitted work done by BM(G) brake, for AC motors in category 3G (zone 2), protection type nA



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12.10 Working air gap for SEW brakes

Motor size	Brake type	Working air gap [mm]	
		New value ¹⁾	Adjust at
71/80	BMG05, BC05	min 0.25	max 0.6
80	BMG1, BC05		
90/100	BMG02, BC2		
100	BMG4, BC2		
112/132S	BMG8	min 0.3	max 1.2
132M/160M	BM15		
160L/180	BM30		
200/225	BM31		
250/280	BMG61		
180	BM32 ²⁾	min 0.4	max 1.2
200/225	BM62 ²⁾		
250/280	BMG122 ²⁾		

1) The measured value can differ from the specified value by 0.1 mm after the test run

2) Double disc brake

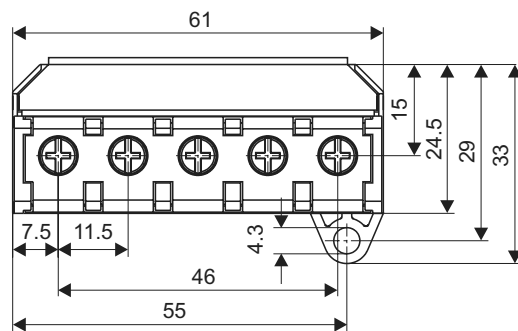
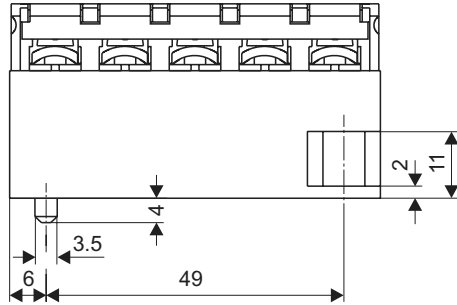


An air gap setting is not required for BR brakes.



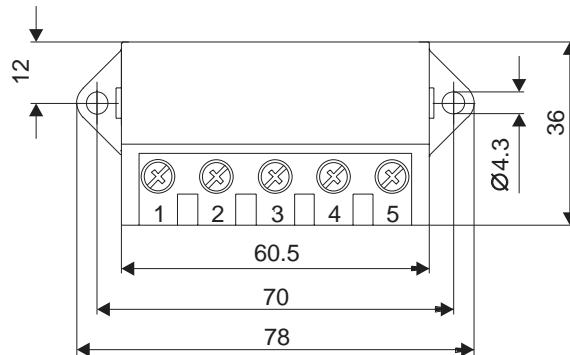
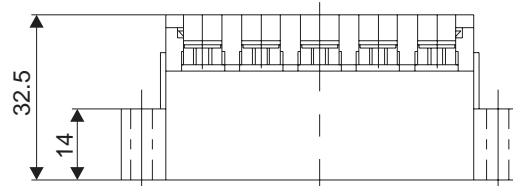
12.11 Dimension sheets for brake control systems

BG1.2, BG2.4

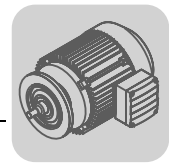


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**BG1.5, BG3, BGE
1.5, BGE 3, BS,
BSG**

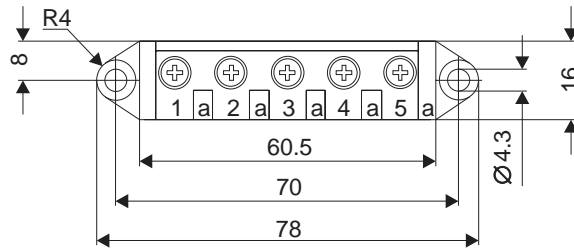
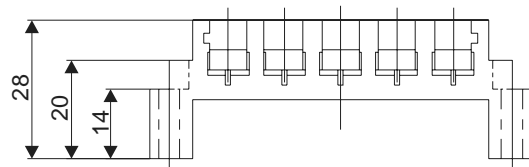


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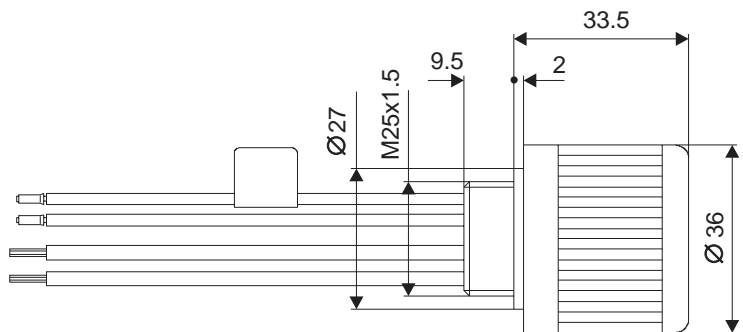
Auxiliary terminal strip

For connection of the brake coil or TF/TH and strip heaters in the wiring space of the motor



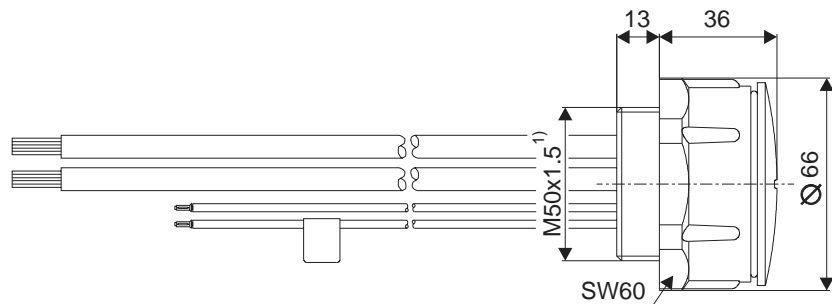
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SR, UR



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SR19

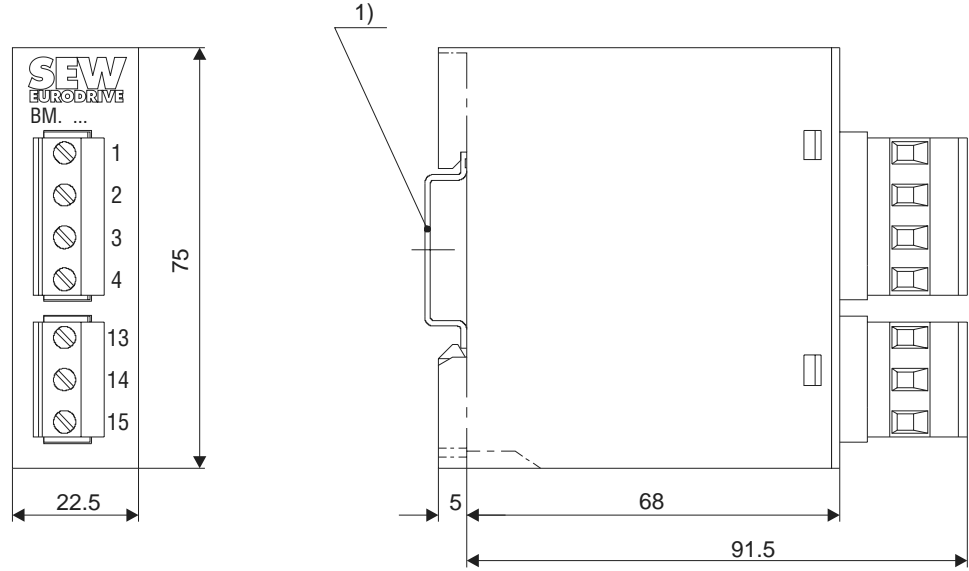


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1) With reducing sleeve to M50x1.5

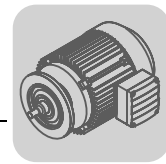


**BMS, BME, BMH,
BMP, BMK, BMV**



01645BXX

[1] Support rail mounting EN 50022-35-7.5



13 Explanation of Abbreviations

Abbreviation	Meaning
AWG	American Wire Gauge
BS	Accelerator coil
BU	Blue
E _D	Cyclic duration factor
I _B	Inrush current
I _H	Holding current
I _B /I _H	Inrush current ratio
I _G	Direct current in the brake coil
I _{Hmax}	Maximum holding current
IS	Coil current
M _B	Braking torque
M _{B red}	Reduced braking torque
M _{B max}	Maximum braking torque
M _{B1}	Maximum braking torque for servomotors
M _{B2}	Minimum braking torque for servomotors
n	Speed
RB	Accelerator coil resistance at 20 °C
RT	Coil section resistance at 20 °C
P _B	Brake coil power consumption at 20 °C
t ₁	Brake response time
t ₂	Brake application time
t _{2I}	Brake application time with cut-off in the AC circuit for separate brake current supply
t _{2II}	Brake application time with cut-off in the AC and DC circuits
TS	Coil section
UN	Rated voltage
W	Total braking work until replacement of brake lining
W _{max}	Maximum permitted work done per cycle
WH	White
RD	Red
w	Number of turns in the spring



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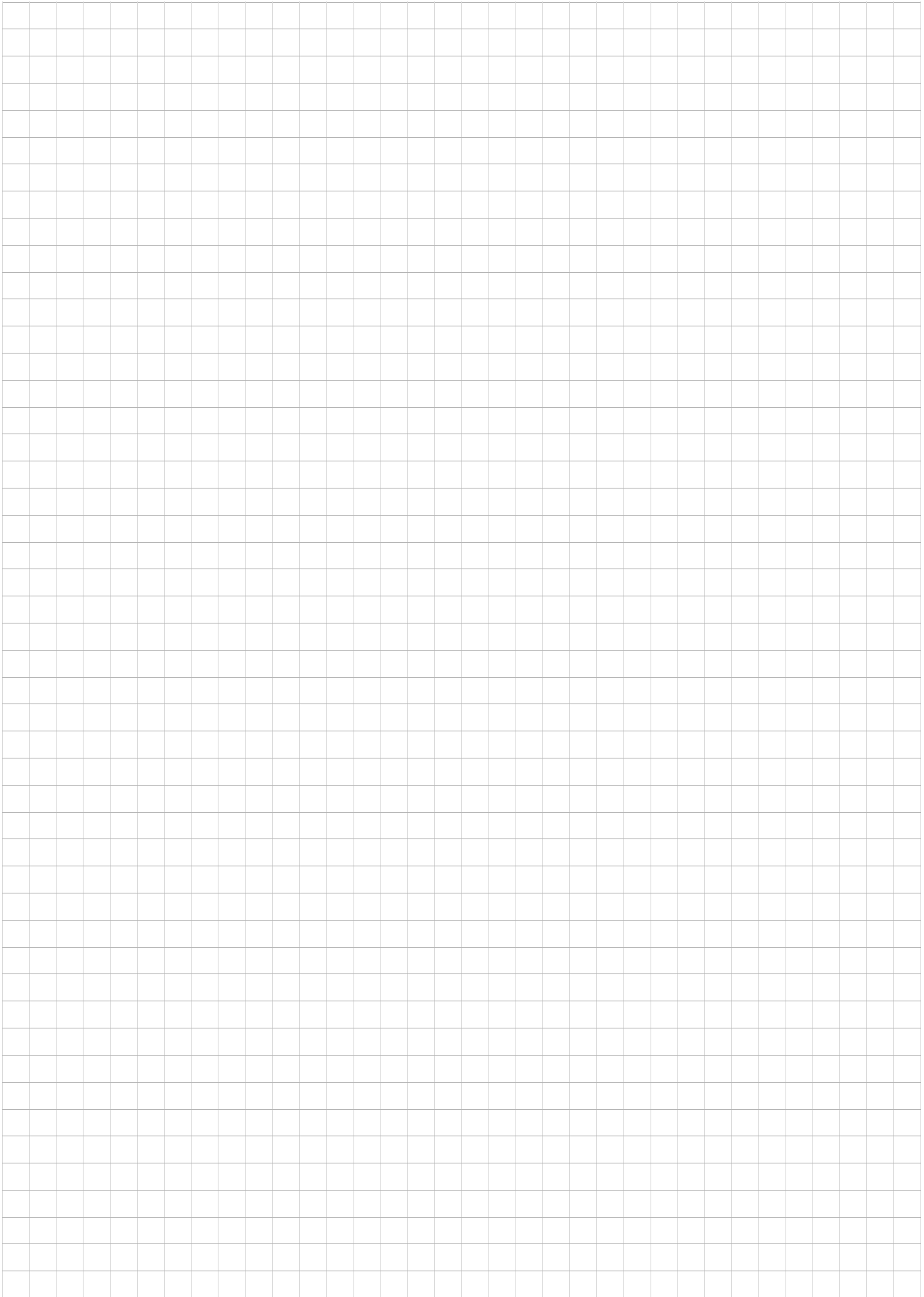
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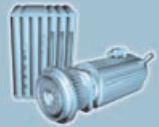
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