7 Project Planning for AC Motors

7.1 Possible motor options (→ GM, → MM)

Overview

The following motor options are available in various combinations:

- BM(G)/BR disc brakes (→ page 106)
- IS integrated plug connector (→ page 118)
- Plug connectors AS.., AC.., AM.., AB.., AD.., AK.. (→ page 119)
- APG plug connector. (→ page 120)
- ASK1 plug connector (→ page 121)
- Encoders and pre-fabricated cables for encoder connection (→ page 123)
- Encoder mounting adapter (→ page 126)
- Forced cooling fan VR/VS/V (→ page 131)
- Backstop RS (→ page 132)
- Additional flywheel mass Z (flywheel fan) (→ page 132)
- Protection canopy C (→ page 133)
- MOVIMOT® integrated frequency inverter (→ page 134)
- Integrated motor circuit breaker/motor protection MOVI-SWITCH® (→ page 143)
- Smooth pole-changing unit WPU (→ page 147)

Technical data and dimension drawings

The technical data and dimension drawings for the motor options are listed in the price catalog / catalog "Gearmotors."

7.2 Standards and regulations (→ GM)

Conformance to standards

AC motors and AC brake motors from SEW-EURODRIVE conform to the relevant standards and regulations, in particular:

- IEC 60034-1, EN 60034-1

  Rotating electrical machinery, rating and performance.
- EN 60529

  IP degrees of protection provided by enclosures of electrical equipment.
- IEC 60072

  Dimensions and performance of rotating electrical machinery.
- EN 50262

  Metric threads of cable glands.
- EN 50347

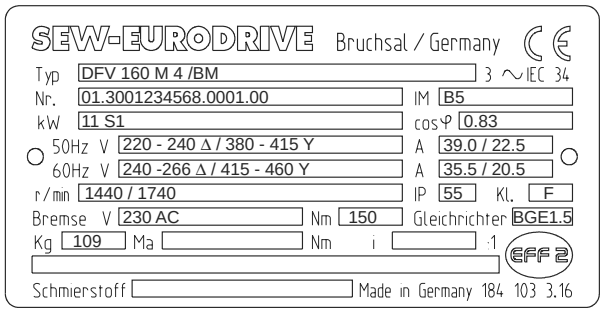
  Standardized dimensions and power ratings.

Rated data

The specific data of an asynchronous AC motor (AC squirrel cage motor) are:

- Size
- Rated power
- Cyclic duration factor
- Rated speed
- Rated current
- Rated voltage
- Power factor cosφ
- Enclosure
- Thermal classification
- Efficiency class

This data is given on the nameplate of the motor. In accordance with IEC 60034 (EN 60034), the nameplate data apply to a maximum ambient temperature of 40 °C and a maximum altitude of 1000 m above sea level.



03214AXX

Figure 37: Motor nameplate

Tolerances

According to IEC 60034 (EN 60034), the following tolerances are permitted for electric motors (also applies to the rated voltage range):

Voltage and frequency		Tolerance A or tolerance B
Efficiency η	$P_N \leq 50$ kW $P_N > 50$ kW	-0,15 • (1-η) -0,1 • (1-η)
Power factor cosφ		$-\frac{1 - \cos\varphi}{6}$
Slip	$P_N < 1$ kW $P_N \geq 1$ kW	±30% ±20%
Starting current		+20%
Tightening torque		-15%...+25%
Breakdown torque		-10%
Mass moment of inertia		±10%

Tolerance A, tolerance B

Tolerances A and B describe the permitted range within which the frequency and voltage are allowed to deviate from their respective rated points. The origin identified with "0" indicates the respective rated points for frequency and voltage.

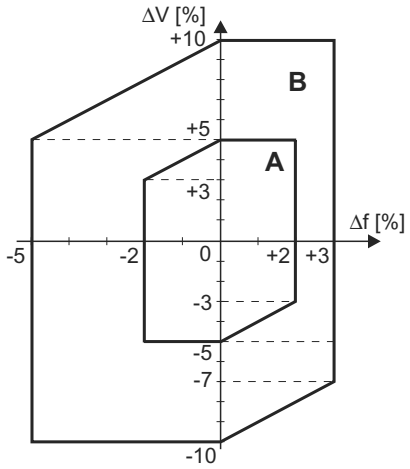


Figure 38: Tolerance ranges A and B

In the tolerance range A, the motor must be able to deliver the rated torque in continuous duty (S1). The other characteristic values and the increase in temperature may deviate slightly from the values for rated voltage and rated frequency.

In the tolerance range B, the motor must be able to deliver the rated torque but not in continuous duty. The increase in temperature and deviations from the rated data are higher than in tolerance range A. Avoid frequent operation of the motor at the limits of tolerance range B.

Undervoltage

It is not possible to achieve the values in the catalog such as power, torque and speed in the event of undervoltage due to weak supply systems or an insufficiently large motor cable. This is applies in particular to the starting up phase of the motor during which the starting current amounts to a multiple of the rated current.

7.3 Circuit breakers and protective equipment

EMC measures

AC motors, AC brake motors and MOVIMOT® drives from SEW-EURODRIVE are components for installation in machinery and systems. The designer of the machine or system is responsible for complying with the EMC Directive 89/336/EEC. Please refer to the publication "Drive Engineering - Practical Implementation, Electromagnetic Compatibility (EMC) in Drive Engineering" for detailed information about this topic. For specific information on MOVIMOT® drives, refer to the "Drive System for Decentralized Installation" system manual.

Mains operation, MOVIMOT® drives

SEW-EURODRIVE AC (brake) motors satisfy the EMC generic standards EN 50081 and EN 50082 when used in accordance with their designated use in continuous mains operation. Interference suppression measures are not necessary. MOVIMOT® drives also satisfy the EMC generic standards EN 50081 and EN 50082 when operated in accordance with their designated use.

Switching operation

For switching operation of the motor, take suitable measures for suppressing interference from the switchgear.

Inverter operation

Regarding inverter operation, please refer to the installation and EMC instructions provided by the inverter manufacturer. Also note the following points:

Brake motors on the inverter

Install the brake cables of brake motors separately from the other power cables, maintaining a distance of at least 200 mm. Joint installation is only permitted if either the brake cable or the power cable is shielded.

Tachometer connection on the inverter

Observe the following instructions when connecting the tachometer:

- Use a shielded cable with twisted pair conductors only.
- Connect the shield to the PE potential on both ends over a large surface area.
- Install signal cables separately from power cables or brake cables (min. distance 200 mm).

Positive temperature coefficient (PTC) thermistor TF connection on the inverter

Install the connecting lead of the positive temperature coefficient (PTC) thermistor TF separately from other power cables, maintaining a distance of at least 200 mm. Collective installation is only permitted if either the TF cable or the power cable is shielded.

Motor protection

Selecting the correct protection device is a significant factor in determining the operational reliability of the motor. We distinguish between protection devices that are current-dependent and those that depend on the motor temperature. Current-dependent protection devices include fuses or motor circuit breakers. Temperature dependent protection devices are PTC thermistors or bimetallic switches (thermostats) in the winding. PTC thermistors or bimetallic switches respond when the maximum permitted winding temperature is reached. Their advantage is that temperatures are measured right where they occur.

Motor circuit breakers

Motor circuit breakers offer adequate protection against overload in standard operation with a low starting frequency, brief start-ups and starting currents that are not excessive. The motor circuit breaker is set to the rated motor current.

Motor circuit breakers are not adequate as the sole means of protection given switching operation with a high starting frequency (> 60 1/h) and for high inertia starting. In these cases, we recommend you use positive temperature coefficient (PTC) thermistors TF in addition.

PTC thermistor

Three positive temperature coefficient (PTC) thermistors **TF** (PTC, characteristic curve according to DIN 44080) are connected in series in the motor and connected from the terminal box to the TF/TH input of the inverter or to a trip switch in the control cabinet. Motor protection with positive temperature coefficient (PTC) thermistors TF provide comprehensive protection against thermal overload. Motors protected in this way can be used for high inertia starting, switching and braking operation as well as with fluctuating mains power supply. A motor circuit breaker is usually installed in addition to the TF. SEW-EURODRIVE recommends always using motors equipped with TF for inverter operation.

Bimetallic switch

Three bimetallic switches **TH**, connected in series in the motor, are looped directly into the motor monitoring circuit from the terminal box.

Fuses

Fuses do not protect the motor from overload. Their only purpose is short-circuit protection.

The following table provides an overview of the various protection devices used for various causes.

○ = no protection ◑ = limited protection ● = comprehensive protection	Current dependent protection device		Temperature dependent protection device	
	Fuse	Protective circuit breaker	PTC thermistor (TF)	Bimetallic switch (TH)
Over-currents up to 200 % I_N	○	●	●	●
High inertia starting, reversal	○	◑	●	◑
Switching operation up to Z = 30 1/h	○	◑	●	●
Stalling	◑	◑	◑	◑
Single phasing	○	◑	●	●
Voltage deviation	○	●	●	●
Frequency deviation	○	●	●	●
Insufficient motor cooling	○	○	●	●

MOVIMOT® protection devices

- MOVIMOT® integrate protective equipment to prevent thermal damage.
- No other external devices are required for motor protection.

Secure switching of inductances

Note the following notes for switching of inductances:

- Switching of low-speed motor windings.

  If the cable is installed unfavorably, switching of low-speed motor windings can generate voltage peaks. Voltage peaks can damage windings and contacts. Install varistors in the incoming cable to avoid such problems.

- Switching of brake coils.

  Varistors must be used to avoid harmful switching overvoltages caused by switching operations in the DC circuit of disk brakes.

  Brake control systems from SEW-EURODRIVE are equipped with varistors as standard. Use contactors with contacts in utilization category AC3 or better to EN 60947-4-1 for switching of brake coils.

- Suppressor circuit on the switching devices.

  According to EN 60204 (Electrical Equipment of Machines), motor windings must be equipped with interference suppression to protect the numerical or programmable logic controllers. Because problems are primarily caused by switching operations, we recommend installing suppressor circuits on the switching devices.

7.4 Electrical characteristics (→ GM, → MM)

Suitability for use with an inverter

AC (brake) motors can be operated on inverters, for example SEW-EURODRIVE MOVIDRIVE®, MOVITRAC® and MOVIMOT®, thanks to the high quality of insulation (including phase separator) with which they are equipped as standard.

The winding option "reinforced insulation" is available for voltages higher than AC 500 V. The SEW unit designation for this option is "/RI".

Frequency

SEW-EURODRIVE AC motors are designed for a system frequency of 50 Hz or 60 Hz on request. As standard, the technical data for AC motors refer to a 50 Hz supply frequency.

Motor voltage

AC motors are available for rated voltages from 220 to 690 V. Pole-changing motors in sizes 63 ... 90 are available for rated voltages from 220 ... 500 V only.

Motor sizes 71 to 132S are usually supplied in a version for the voltage range 220 ... 240/380 × 415 V_{AC}, 50 Hz. The jumpers for setting the star or delta connection are supplied with the motor in a bag inside the terminal box. For motor sizes >132S, the standard design is 380 ... 415/660 ... 690 V_{AC}, 50 Hz. The star or delta jumpers are mounted on the terminal board.

For 50 Hz power supply

The **standards voltages** are:

Motors	Motor size	
	56 (4-pole only)	63...90
	Motor voltage	
2, 4 and 6-pole motors, applies to the voltage range	220...240 V_{AC} 人 380...415 V_{AC} 人	220...240/380...415 V_{AC} Δ/人
Single-speed	-	230/400 V_{AC} Δ/人 290/500 V_{AC} Δ/人
Multi-speed, Dahlander	-	400 V_{AC} Δ/人人
Multi-speed, separate winding	-	400 V_{AC} 人 / 人
	Brake voltage	
2, 4 and 6-pole motors, applies to the voltage range	220...240 V_{AC} 380...415 V_{AC}	220...240 V_{AC} 380...415 V_{AC}
Standard voltages	24 V_{DC} / 230 V_{AC} / 400 V_{AC}	
	Forced cooling fan voltage	
Standard voltage VR	-	24 V_{DC} [1]
Voltage range VS	-	1 × 220...266 V_{AC} [1]

1) not applicable for motor size

Motors	Motor size		
	100...132S	132M...225	225...280
	Motor voltage		
2, 4 and 6-pole motors, applies to the voltage range	220...240/ 380...415 V_{AC} Δ/人	220...240/380...415 V_{AC} Δ/人 380...415/660..0.690 V_{AC} Δ/人	
Single-speed	230/400 V_{AC} Δ/人 290/500 V_{AC} Δ/人 400/690 V_{AC} Δ/人 500 V_{AC} Δ		
Multi-speed, Dahlander	400 V_{AC} Δ/人人		
Multi-speed, separate winding	400 V_{AC} 人 / 人		
	Brake voltage		
2, 4 and 6-pole motors, applies to the voltage range	220..0.240 V_{AC} 380...415 V_{AC}		
Standard voltages	24 V_{DC} / 230 V_{AC} / 400 V_{AC}		
	Forced cooling fan voltage		
Standard voltage VR	24 V_{DC}	-	-
Voltage range VS	1 × 220...266 V_{AC}	-	-
Voltage range V	-	3 × 380...415 V_{AC}	3 × 346...500 V_{AC}

Motors and brakes for 230/400 V_{AC} and motors for 690 V_{AC} may also be operated on supply systems with a rated voltage of 220/380 V_{AC} or 660 V_{AC} respectively. The voltage dependent data will slightly change in this case.

Standard connections 50 Hz motors

No. of poles	Synchronous speed n_{syn} at 50 Hz [1/min]	Connection
2	3000	人 / Δ
4	1500	人 ; 人 / Δ
6	1000	人 / Δ
8	750	人 / Δ
8/4	750/1500	Δ/人人 Dahlander
8/2	750/3000	人 / 人 separate winding

50 Hz motor on 60 Hz supply system

The rated data of motors designed for 50 Hz supply systems are slightly different when the motors are operated on 60 Hz supply systems.

Motor voltage at 50 Hz	Motor connection	U [V] at 60 Hz	Changed rated data			
			n_N	P_N	M_N	M_A/M_N
230/400 V_{AC} Δ/人	Δ	230	+20%	0%	-17%	-17%
230/400 V_{AC} Δ/人	人	460	+20%	+20%	0%	0%
400/690 V_{AC} Δ/人	Δ					

For 60 Hz power supply

The **standard voltages** are indicated in **bold**:

Motors	Motor size		
	56	**63**	**71...90**
	Motor voltage		
2, 4 and 6-pole motors, applies to the voltage range	**240..0.266 V_{AC}** 人 **415..0.460 V_{AC}** 人	**240...266/415..0.460 V_{AC}** Δ/人	
Single-speed	-	**266/460 V_{AC}** Δ/人 220/380 V_{AC} Δ/人 330/575 V_{AC} Δ/人	**266/460 V_{AC}** Δ/人 220/380 V_{AC} Δ/人 330/575 V_{AC} Δ/人 200/400 V_{AC} 人人/人 220/440 V_{AC} 人人/人 230/460 V_{AC} 人人/人
Multi-speed, Dahlander	-	460 V_{AC} Δ/人人	
Multi-speed, separate winding	-	-	460 V_{AC} 人 / 人
	Brake voltage		
2, 4 and 6-pole motors, applies to the voltage range	**240..0.266 V_{AC}** **415..0.460 V_{AC}**	**240..0.266 V_{AC}** **415..0.460 V_{AC}**	
Standard voltages	**24 V_{DC} / 230 V_{AC} / 266 V_{AC} / 460 V_{AC}**		
	Forced cooling fan voltage		
Standard voltage VR	-	-	**24 V_{DC}**
Voltage range VS	-	-	**1 × 220..0.266 V_{AC}** [1)]

Motors	Motor size		
	100...132S	132M...225	250...280
	Motor voltage		
2, 4 and 6-pole motors, applies to the voltage range	240...266/ 415..0.460 V_{AC} Δ/人	240...266/415..0.460 V_{AC} Δ/人 415..0.460 V_{AC} Δ	
Single-speed	266/460 V_{AC} Δ/人 220/380 V_{AC} Δ/人 330/575 V_{AC} Δ/人 200/400 V_{AC} 人人/人 220/440 V_{AC} 人人/人 230/460 V_{AC} 人人/人		
Multi-speed, Dahlander	460 V_{AC} Δ/人人		
Multi-speed, separate winding	460 V_{AC} 人 / 人		
	Brake voltage		
2, 4 and 6-pole motors, applies to the voltage range	240..0.266 V_{AC} 415..0.460 V_{AC}		
Standard voltages	24 V_{DC} / 230 V_{AC} / 266 V_{AC} / 460 V_{AC}		
	Forced cooling fan voltage		
Standard voltage VR	24 V_{DC}	-	-
Voltage range VS	1 × 220..0.266 V_{AC}	-	-
Voltage range V	-	3 × 415..0.460 V_{AC}	3 × 346...500 V_{AC}

Standard connections 60 Hz motors

No. of poles	Synchronous speed n_{syn} at 60 Hz [1/min]	Connection
2	3600	Δ/人; 人人 / 人
4	1800	Δ/人; 人人 / 人
6	1200	Δ/人; 人人 / 人
8/4	900/1800	Δ/人人 Dahlander
8/2	900/3600	人 / 人 separate winding

60 Hz motor on 50 Hz supply system

The rated data of motors designed for 60 Hz supply systems are slightly different when these motors are operated on 50 Hz supply systems.

Example: NEMA C-motor, designed for the USA, operation on a 50 Hz supply system:

Motor voltage at 60 Hz (USA)	Motor connection	U [V] at 50 Hz	Changed rated data			
			n_N	P_N	M_N	M_A/M_N
230/460 V_{AC} 人人 / 人	人	400	-17%	-17%	0%	0%

Motors for USA and Canada

Motors for USA and Canada are designed according to NEMA or CSA regulations. Single-speed motors in NEMA or CSA design are registered with Underwriters Laboratories (UL). The following voltage assignments (60 Hz) are customary in the USA and Canada:

	Rated voltage of the supply power	Rated voltage of the motor
USA	208 V	200 V
	240 V	230 V
	480 V	460 V
Canada	600 V	575 V

The motor voltage may deviate up to ±10 % from the rated voltage. This deviation corresponds to tolerance B (→ page 88).

In the USA, 230/460 V_{AC} / 60 Hz motors are usually used (→ Sec. International and national markets on page 103).

7.5 Thermal characteristics (→ GM, → MM)

Thermal classes according to IEC 60034-1 (EN 60034-1)

AC motors, AC brake motors and MOVIMOT® drives are available in the following thermal classes:

- The standard design for all single-speed AC motors/AC brake motors and Dahlander motors is thermal class B. Thermal classes F or H are available on request.
- The standard design for all multi-speed AC motors/AC brake motors with separate winding is thermal class F. Thermal class H is available on request.
- Standard design for all MOVIMOT® drives is thermal class F. Other thermal classes are not possible for MOVIMOT® drives.

The table below lists the overtemperatures to IEC 60034-1 (EN 60034-1).

Thermal class		Overtemperature limit [K]
Old	New	
B	**130**	80 K
F	**155**	105 K
H	**180**	125 K

Power reduction

The rated power P_N of a motor depends on the ambient temperature and the altitude. The rated power stated on the nameplate applies to an ambient temperature of 40 °C and a maximum altitude of 1,000 m above sea level. The rated power must be reduced according to the following formula in the case of higher ambient temperatures or altitudes:

$$P_{Nred} = P_N \bullet f_T \bullet f_H$$

AC motors

For AC motors, the factors f_T and f_H are listed in the following diagram:

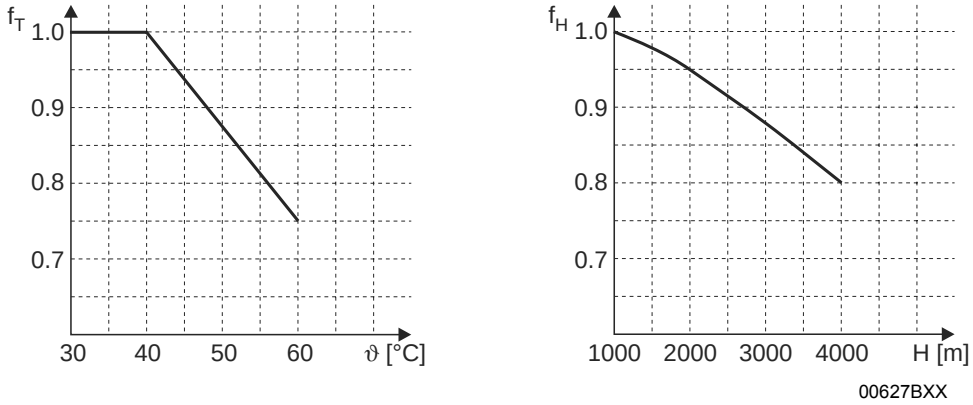


Figure 39: Power reduction dependent on ambient temperature and altitude

ϑ = Ambient temperature
H = Altitude above sea level

MOVIMOT® drives

Für MOVIMOT® drives, the factors f_T und f_H are given in the following diagrams:

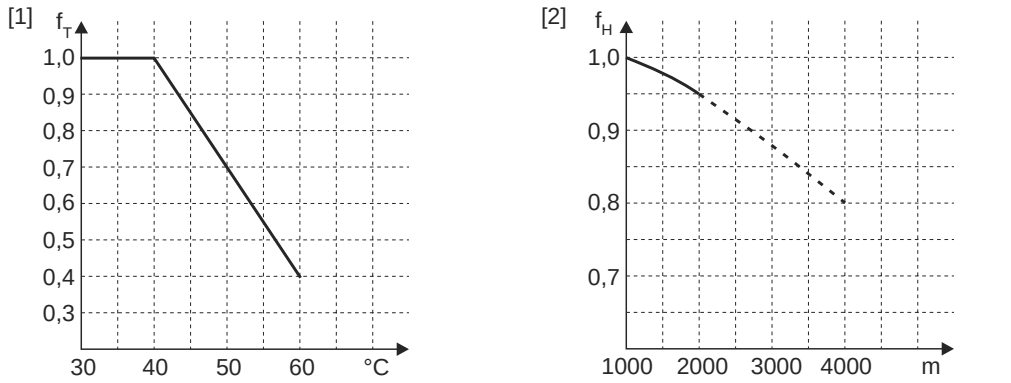


Figure 40: Power reduction dependent on ambient temperature and altitude

[1] Ambient temperature
[2] Altitude above sea level **(Altitudes of more than 2000 m subject to limitations. Observe the installation notes in the "MOVIMOT® MM03C"MM03C-MM3XC** operating instructions.

Duty types

The following duty types are defined in IEC 60034-1 (EN 60034-1):

Duty type	Explanation
S1	**Continuous duty:** Operation at a constant load; the motor reaches thermal equilibrium.
S2	**Short-time duty:** Operation at constant load for a given time followed by a time at rest. The motor returns to ambient temperature during the rest period.
S3	**Intermittent periodic duty:** The starting current does not significantly affect the temperature rise. Characterized by a sequence of identical duty cycles, each including a time of operation at constant load and a time at rest. Described by the "cyclic duration factor (cdf)" in %.
S4...S10	**Intermittent periodic duty:** The starting current affecting the temperature rise. Characterized by a sequence of identical duty cycles, each including a time of operation at constant load and a time at rest. Described by the "cyclic duration factor (cdf)" in % and the number of cycles per hour.

For inverter operation, S1 continuous duty is usually assumed. For a great number of cycles per hour, it may be necessary to assume S9 intermittent periodic duty.

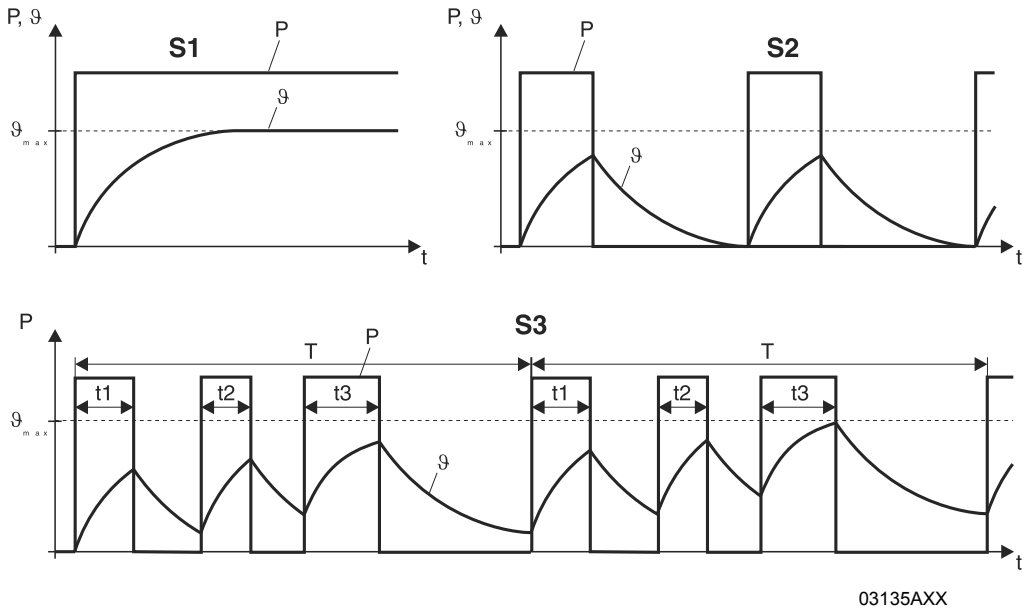


Figure 41: Duty types S1, S2 and S3

Cyclic duration factor (cdf)

The cyclic duration factor (cdf) is the ratio between the period of loading and the duration of the duty cycle. The duration of the duty cycle is the sum of times of operation and times at rest and de-energized. A typical value for the duration of the duty cycle is ten minutes.

$$\text{cdf} = \frac{\text{total on-times (t1 + t2 + t3)}}{\text{cycle duration (T)}} \bullet 100\ [\%]$$

Power increasing factor K

Unless specified otherwise, the rated power of the motor refers to duty type S1 (100 % cdf) according to IEC 60034 (EN 60034). If a motor designed for S1 and 100 % cdf is operated in mode S2 "short-time duty" or S3 "intermittent periodic duty", the rated power can be multiplied by the power increasing factor K specified on the nameplate.

Duty type			Power increasing factor K
S2	Period of operation	60 min 30 min 10 min	1.1 1.2 1.4
S3	Cyclic duration factor (cdf)	60% 40% 25% 15%	1.1 1.15 1.3 1.4
S4...S10	The following information must be specified to determine the rated power and the duty type: number and type of cycles per hour, starting time, time at load, braking type, braking time, idle time, cycle duration, period at rest and power demand.		On request

In the case of extremely high counter torques and high mass moments of inertia (high inertia starting), please contact SEW-EURODRIVE and provide the exact technical data.

7.6 Starting frequency (→ GM, → MM)

A motor is usually rated according to its thermal loading. In many applications the motor is started only once (S1 = continuous running duty = 100 % cdf). The power demand calculated from the load torque of the driven machine is the same as the rated motor power.

High starting frequency

Many applications call for a high starting frequency at low counter-torque, such as in travel drives. In this case, it is not the power demand that is the decisive factor in determining the size of the motor, but rather the number of times the motor has to start up. Frequent starting means the high starting current flows every time, leading to disproportionate heating of the motor. The windings become overheated if the heat absorbed is greater than the heat dissipated by the motor ventilation system. The thermal load capacity of the motor can be increased by selecting a suitable thermal classification or by means of forced cooling (→ Sec. "Thermal characteristics" on page 95).

No-load starting frequency Z_0

SEW-EURODRIVE specifies the permitted starting frequency of a motor as the no-load starting frequency Z_0 at 50 % cdf. This value indicates the number of times per hour that the motor can accelerate the mass moment of inertia of its rotor up to speed without counter-torque at 50 % cdf. If an additional mass moment of inertia has to be accelerated or if an additional load torque occurs, the starting time of the motor will increase. Increased current flows during this acceleration time. This means the motor is subjected to increased thermal load and the permitted starting frequency is reduced.

Permitted starting frequency of the motor

You can determine the permitted starting frequency Z of the motor in cycles/hour [1/h] using the following formula:

$$\mathbf{Z = Z_0 \bullet K_J \bullet K_M \bullet K_P}$$

You can determine the factors K_J, K_M and K_P using the following diagrams:

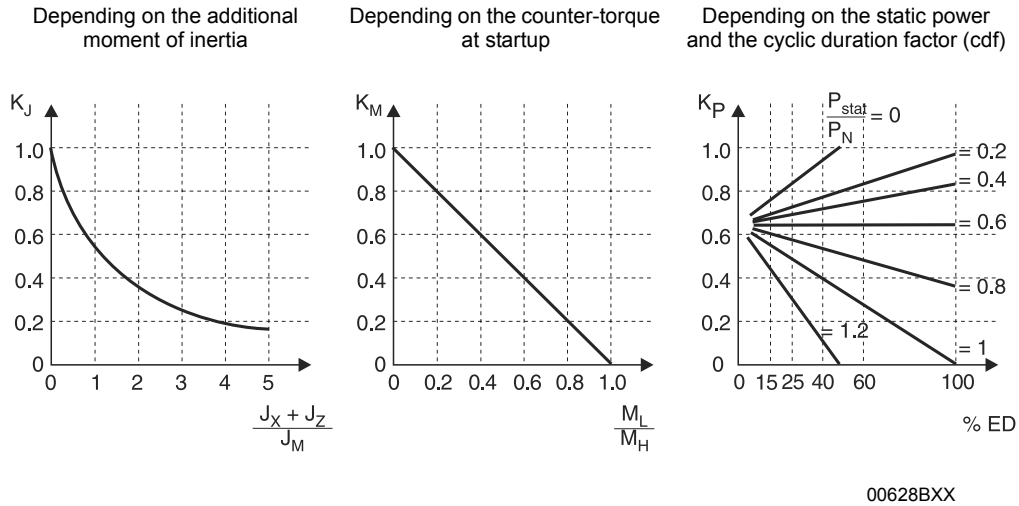


Figure 42: Dependency of the starting frequency

J_X =	Total of all external mass moments of inertia in relation to the motor axis	M_H =	Acceleration torque motor
J_Z =	Mass moment of inertia flywheel fan	P_{stat} =	Power requirement after start-up (static power)
J_M =	Mass moment of inertia of the motor	P_N =	Rated motor power
M_L =	Counter-torque during startup	%cdf =	cyclic duration factor

Example

Motor: DT80N4/BMG (→ Sec. "Technical data of AC motors")
No-load starting frequency Z_0 = 14000 1/h

1. $(J_X + J_Z) / J_M = 3.5$ → $K_J = 0.2$
2. $M_L / M_H = 0.6$ → $K_M = 0.4$
3. $P_{stat} / P_N = 0.6$ and 60% cdf → $K_P = 0.65$

$Z = Z_0 \bullet K_J \bullet K_M \bullet K_P = 14000$ c/h $\bullet$ 0.2 $\bullet$ 0.4 $\bullet$ 0.65 = 728 c/h

The cycle duration is 5 s, the operating time 3 s.

Permitted work done by the brake

If you are using a brake motor, you have to check whether the brake is approved for use with the required starting frequency Z. Refer to the information in Sec. "Permitted work done by the brake" on page 108.

7.7 Mechanical characteristics (→ GM, → MM)

Degrees of protection according to EN 60034 (IEC 60034-5)

The standard degree of protection for AC motors, AC brake motors and MOVIMOT® drives is IP54. Enclosures IP55, IP56, IP65 or IP66 are available upon request.

IP	1st digit		2nd digit
	Touch guard	Protection against foreign objects	Protection against water
0	No protection	No protection	No protection
1	Protected against access to hazardous parts with the back of your hand	Protection against solid foreign objects ∅50 mm and larger	Protection against dripping water
2	Protected against access to hazardous parts with a finger	Protection against solid foreign objects ∅12 mm and larger	Protection against dripping water when tilted up to 15°
3	Protected against access to hazardous parts with a tool	Protection against solid foreign objects ∅2.5 mm and larger	Protection against spraying water
4	Protected against access to hazardous parts with a wire	Protection against solid foreign objects ∅1 mm and larger	Protection against splashing water
5		Protection against dust	Protection against water jets
6		Dust-proof	Protection against powerful water jets
7	-	-	Protection against temporary immersion in water
8	-	-	Protection against permanent immersion in water

Other options

Increased corrosion protection for metal parts and additional impregnation of the winding (protection against moisture and acid) is available as is the supply of explosion-proof motors and brake motors with EExe enclosure (increased safety), EExed (increased safety motor, flameproof brake) and EExd (flameproof). Refer to the information in in Sec. "Product Description and Overview of Types/General information" in this regard.

Vibration properties of motors

The rotors of AC motors are dynamically balanced with a half key. Motors according to vibration severity grade "N" according to DIN ISO 2373 (EN60034-14:1997) or vibration grade "A" according to IEC 60034-14:2003. In the case of specific requirements on the mechanical running smoothness, single-speed motors without brake, forced cooling fan, encoder, etc. are available in low-vibration design vibration class "R" according to DIN ISO 2373 or vibration grade "B" according to IEC 60034-14:2003.

7.8 Overhung loads (→ GM, → MM)

Refer to the section "Project Planning for Gear Units"Overhung loads and axial forces/ for general information about overhung loads. The following table lists the permitted overhung loads (top value) and axial forces (bottom value) of AC motors:

Mounting position	[1/min] No. of poles	Permitted overhung load F_R [N] Permitted axial load F_A [N]; $F_{A\_tension} = F_{A\_pressure}$ Size													
		63	71	80	90	100	112	132S	132ML 132M	160M	160L	180	200	225	250 280
Foot mounted motor	750 8	- -	680 200	920 240	1280 320	1700 400	1750 480	1900 560	2600 640	3600 960	3800 960	5600 1280	6000 2000	- -	- -
	1000 6	- -	640 160	840 200	1200 240	1520 320	1600 400	1750 480	2400 560	3300 800	3400 800	5000 1120	5500 1900	- -	8000 2500
	1500 4	- -	560 120	720 160	1040 210	1300 270	1400 270	1500 270	2000 400	2600 640	3100 640	4500 940	4700 2400	7000 2400	8000 2500
	3000 2	- -	400 80	520 100	720 145	960 190	980 200	1100 210	1450 320	2000 480	2300 480	3450 800	3700 1850	- -	- -
Flange-mounted motor	750 8	- -	850 250	1150 300	1600 400	2100 500	2200 600	2400 700	3200 800	4600 1200	4800 1200	7000 1600	7500 2500	- -	- -
	1000 6	600 150	800 200	1050 250	1500 300	1900 400	2000 500	2200 600	2900 700	4100 1000	4300 1000	6300 1400	6800 2400	- -	11000 3000
	1500 4	500 110	700 140	900 200	1300 250	1650 350	1750 350	1900 350	2500 500	3200 800	3900 800	5600 1200	5900 3000	8700 3000	9000 2600
	3000 2	400 70	500 100	650 130	900 180	1200 240	1200 250	1300 260	1800 400	2500 600	2900 600	4300 1000	4600 2300	- -	- -

Overhung load conversion for off-center force application

The permitted overhung loads must be calculated using the following formulae in the event that force is not applied at the center of the shaft end. The smaller of the two values F_{xL} (according to bearing service life) and F_{xW} (according to shaft strength) is the permitted value for the overhung load at point x. Note that the calculations apply to M_N.

F_{xL} based on bearing life

$$F_{xL} = F_R \cdot \frac{a}{b + x} \text{ [N]}$$

F_{xW} from the shaft strength

$$F_{xW} = \frac{c}{f + x} \text{ [N]}$$

F_R = Permitted overhung load (x = l/2) [N]

x = Distance from the shaft shoulder to the force application point [mm]

a, b, f = Motor constant for overhung load conversion [mm]

c = Motor constant for overhung load conversion [mm]

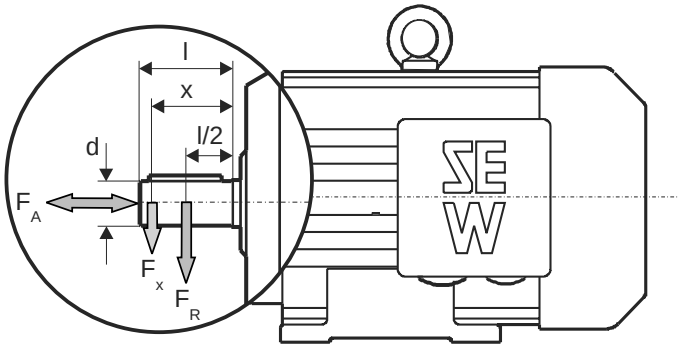


Figure 43: Overhung load FX for off-center force application

Motor constants for overhung load conversion

Size	a	b	c				f	d	l
	[mm]	[mm]	2-pole [Nmm]	4-pole [Nmm]	6-pole [Nmm]	8-pole [Nmm]	[mm]	[mm]	[mm]
63	161	146	$11.2 \bullet 10^3$	$16.8 \bullet 10^3$	$19 \bullet 10^3$	-	13	14	30
71	158.5	143.8	$11.4 \bullet 10^3$	$16 \bullet 10^3$	$18.3 \bullet 10^3$	$19.5 \bullet 10^3$	13.6	14	30
80	213.8	193.8	$17.5 \bullet 10^3$	$24.2 \bullet 10^3$	$28.2 \bullet 10^3$	$31 \bullet 10^3$	13.6	19	40
90	227.8	202.8	$27.4 \bullet 10^3$	$39.6 \bullet 10^3$	$45.7 \bullet 10^3$	$48.7 \bullet 10^3$	13.1	24	50
SDT100	270.8	240.8	$42.3 \bullet 10^3$	$57.3 \bullet 10^3$	$67 \bullet 10^3$	$75 \bullet 10^3$	14.1	28	60
DV100	270.8	240.8	$42.3 \bullet 10^3$	$57.3 \bullet 10^3$	$67 \bullet 10^3$	$75 \bullet 10^3$	14.1	28	60
112M	286.8	256.8	$53 \bullet 10^3$	$75.7 \bullet 10^3$	$86.5 \bullet 10^3$	$94.6 \bullet 10^3$	24.1	28	60
132S	341.8	301.8	$70.5 \bullet 10^3$	$96.1 \bullet 10^3$	$112 \bullet 10^3$	$122 \bullet 10^3$	24.1	38	80
132M	344.5	304.5	$87.1 \bullet 10^3$	$120 \bullet 10^3$	$144 \bullet 10^3$	$156 \bullet 10^3$	20.1	38	80
132ML	404.5	364.5	$120 \bullet 10^3$	$156 \bullet 10^3$	$198 \bullet 10^3$	$216.5 \bullet 10^3$	20.1	38	80
160M	419.5	364.5	$150 \bullet 10^3$	$195.9 \bullet 10^3$	$248 \bullet 10^3$	$270 \bullet 10^3$	20.1	42	110
160L	435.5	380.5	$177.5 \bullet 10^3$	$239 \bullet 10^3$	$262.5 \bullet 10^3$	$293 \bullet 10^3$	22.15	42	110
180	507.5	452.5	$266 \bullet 10^3$	$347 \bullet 10^3$	$386 \bullet 10^3$	$432 \bullet 10^3$	22.15	48	110
200	537.5	482.5	$203.5 \bullet 10^3$	$258.5 \bullet 10^3$	$302.5 \bullet 10^3$	$330 \bullet 10^3$	0	55	110
225	626.5	556.5	-	$490 \bullet 10^3$	-	-	0	60	140
250	658	588	-	$630 \bullet 10^3$	-	-	0	65	140
280	658	588	-	$630 \bullet 10^3$	-	-	0	75	140

2nd motor shaft

Contact SEW-EURODRIVE regarding permitted load for 2nd motor shaft end.

Motor bearings used

The following table shows which bearings are used in SEW-EURODRIVE AC (brake) motors:

Motor type	Drive-end bearing			Non drive-end bearing	
	Flange-mounted motor	Gearmotor	Foot mounted motor	without brake	with brake
56	-	6302-Z	-	6001-2RS-J	
63	6203-2Z-J	6303-2Z-J	-	6202-2Z-J	6202-2RS-J-C3
71 ... 80	6204-Z-J	6303-Z-J	6204-Z-J	6203-2Z-J	6203-2RS-J-C3
90 ... 100	6306-Z-J			6205-2Z-J	6205-2RS-J-C3
112 ... 132S	6208-Z-J	6307-Z-J	6208-Z-J	6207-2Z-J	6207-2RS-J-C3
132M ... 160M	6309-2Z-J-C3			6209-2Z-J-C3	
160L ... 180L	63122Z-J-C3			6213-2Z-J-C3	
200 ... 225	6314-2Z-J-C3			6314-2Z-J-C3	
250 ... 280	6316-2Z-J-C3			6315-2Z-J-C3	

7.9 Special markets (→ GM, → MM)

CSA/NEMA/UL-R

SEW-EURODRIVE offers the NEMA MG1 version or the "CSA/UL-R" option for drives delivered to North America (→ " Motors for the USA and Canada" on page 94). These versions have the following characteristic features:

- Terminal designation T1, T2, etc. in addition to U1, V1, etc.
- In MOVIMOT® drives additional earth terminal via an external terminal.
- Some terminal boxes are made of gray-cast iron and others of aluminum:

Motor size	Terminal box material
DT56/DR63	Aluminum (part of the motor housing)
DT71 ... DV132S	Gray-cast iron for wiring diagram DT79, otherwise aluminum
DT71 ... DV132S / BM(G) with BSR/BUR	Gray-cast iron
DV132M ... DV280	Always gray cast iron

- Cable entry in the terminal box compliant with ANSI / ASME B1.20.1.-1983 with NPT threads (conical inch threads). The following table shows the number of cable entries and NPT sizes for the respective motor sizes.

Motor size	Number and type of threads
DT56	1 × 1/2'' NPT + 1 × 3/8'' NPT (with adapter)
DR63	2 × 1/2'' NPT (with adapter)
DT71 ... DT90	2 × 1/2'' NPT
DV100 ... DV132S	1 × 3/4'' NPT + 1 × 1/2'' NPT
DV132M ... DV160M	1 × 1 1/4'' NPT + 1 × 1/2'' NPT
DV160L ... DV225	2 × 1 1/2'' NPT + 1 × 1/2'' NPT
DV250M ... DV280S	2 × 2 1/2'' NPT + 2 × 1/2'' NPT

The NPT openings are sealed with plugs for transportation and storage.

- For AC motors/AC brake motors modified nameplate with the following information: TEFC, K.V.A. code and design. With CSA/UL-R option also CSA and UR mark (UL registration no. E189357).

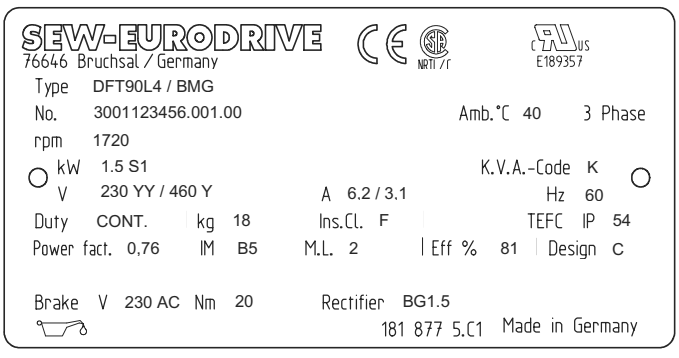


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Figure 44: Motor nameplate for the CSA/UL-R version

- For MOVIMOT® drives modified nameplate with the following information: TEFC, UL identification character (UL registration no. 2D06).

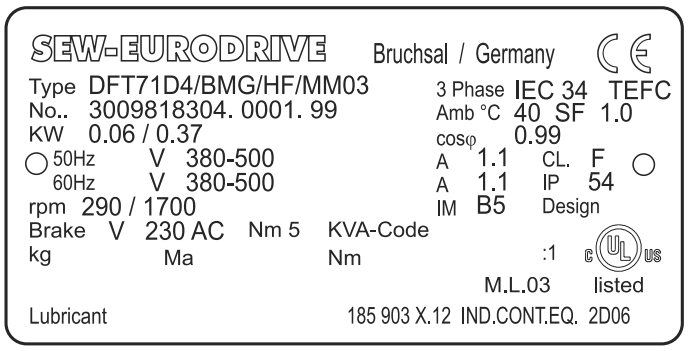

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Figure 45: Motor nameplate

JIS / JEC

The drives can be built according to JIS for delivery to Japan. SEW-EURODRIVE supplies special motor terminal boxes on request. These terminal boxes have cable entries with the PF threads (straight inch thread) customary in Japan.

V.I.K. (German Association of the Energy and Power Generation Industry)

The German association of the Energy and Power Generation Industry V.I.K. has published for its members a recommendation for the implementation of technical requirements for AC asynchronous motors.

The drives from SEW-EURODRIVE can be supplied in compliance with these requirements. The following deviations from the standard are taken into account:

- Motor with enclosure of at least IP55.
- Motor of thermal class F, permitted overtemperature only as in thermal class B.
- Corrosion protection of motor parts.
- Terminal box made of gray cast iron.
- Protection canopy for vertical motor mounting positions with fan guard on top.
- Additional earth terminal via external terminal.
- Nameplate with V.I.K. information. A second nameplate on the inside of the terminal box cover.

Note

Technical requirements issued by the V.I.K. must be applied analogously to gearmotors, pole-changing motors and motors for high inertia starting, switching operation and speed control. The requirements result in the following necessary deviations:

- Mounting position: The position of the breather valves and the lubricant fill quantities, which depend on the mounting position, means that gearmotors cannot be used in either horizontal or vertical mounting positions.
- Sign: No bores are provided for attaching an additional identification sign.

CCC

After joining the World Trade Organization (WTO), the People's Republic of China issued a certification system - CCC "China Compulsory Certification" - for products. CCC became effective on 1 May 2002 and replaced the marks "Great Wall" (CCEE China Commission for Conformity of Electric Equipment) for domestic products and "CCIB" (China Commodity Inspection Bureau) for imported products. The Chinese government is trying to improve the safety for household appliances by introducing the CCC certification. The certification requirement became effective on 1 August 2003 for many products in household applications.

That means machines and systems supplied by our customers with permanently installed motors and gearmotors are usually not subject to this mandatory certification. The only known exception are welding machines. That means CCC certification will only become an issue for machine and system supplier in case they are exporting individual products, such as spare parts.

This certification affects SEW-EURORDRIVE products as well. The drive solutions from SEW-EURODRIVE received the necessary certification on 29 July 2003.

The SEW-EURODRIVE products affected by this certification are:

- 2-pole motors up to 2.2 kW
- 4-pole motors up to 1.1 kW
- 6-pole motors up to 0.75 kW
- 8-pole motors up to 0.55 kW

These motors may be identified with the CCC mark upon request and will be delivered with the certificate attached to the drive.

7.10 Brakes (→ GM)

General

On request, SEW-EURODRIVE motors and gearmotors can be supplied with an integrated mechanical brake. The brake is a DC-operated electromagnetic disc brake that is released electrically and applied using spring force. The brake is applied in case of a power failure. It meets the basic safety requirements. The brake can also be released mechanically if equipped with manual brake release. You will either receive a manual lever with automatic reset or an adjustable setscrew for this purpose. The brake is controlled by a control element that is either installed in the motor wiring space or the control cabinet. For detailed information on brakes from SEW-EURODRIVE, refer to the publication "Drive Engineering - Practical Implementation – SEW Disc Brake."

A main advantage of brakes from SEW-EURODRIVE is their very short design. The brake bearing end shield is a part of both the motor and the brake. The integrated construction of the brake motor permits particularly compact and sturdy solutions.

Basic structure

The illustration below shows the basic structure of the brake.

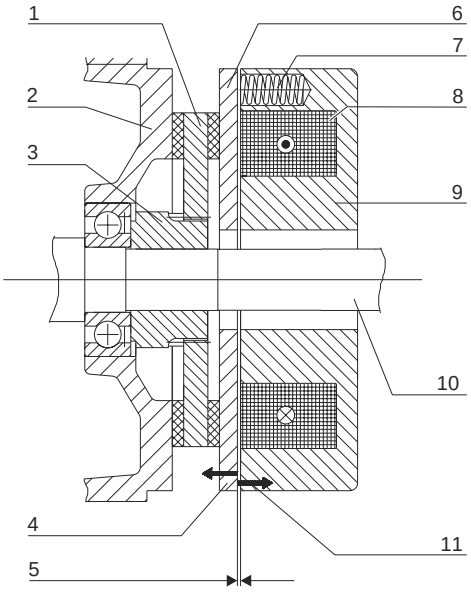

Figure 46: Basic structure of the brake

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

Short response times

A characteristic feature of the brake is the patented two-coil system. This system comprises the accelerator coil BS and the coil section TS. The special SEW-EURODRIVE brake control system ensures that, when the brake is released, the accelerator coil is switched on first with a high current inrush, after which the coil section is switched on. The result is a particularly short response time when releasing the brake. The brake disk moves clear very swiftly and the motor starts up with hardly any brake friction.

This principle of the two coil system also reduces self-induction so that the brake is applied more rapidly. The result is a reduced braking distance. The brake can be switched off in the DC and AC circuit to achieve particularly short response times when applying the brake, for example in hoists.

Permitted work done by the brake

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 (→ Figure 48).

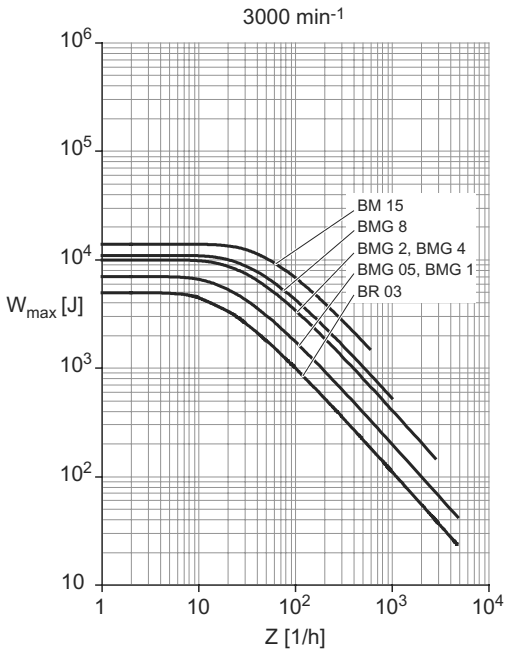

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Figure 47: Maximum permitted work done per cycle at 3000 min-1

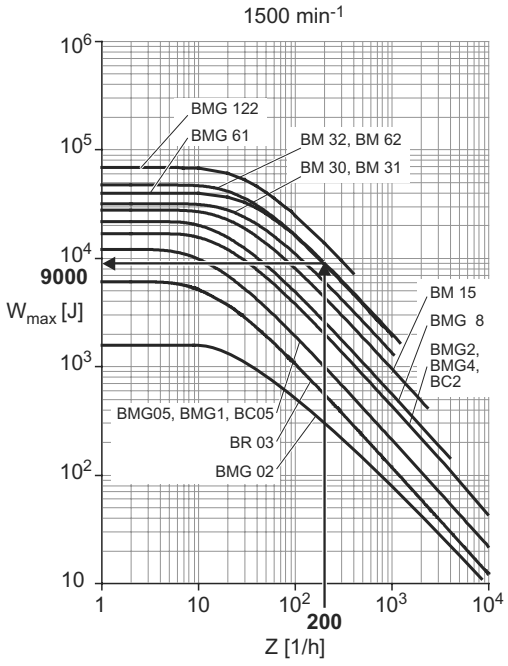

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Figure 48: Maximum permitted work done per cycle at 1500 min-1

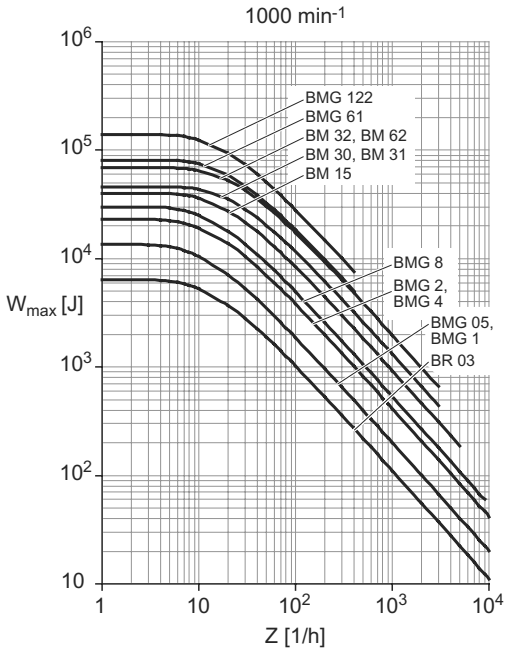

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Figure 49: Maximum permitted work done per cycle at 1000 min-1

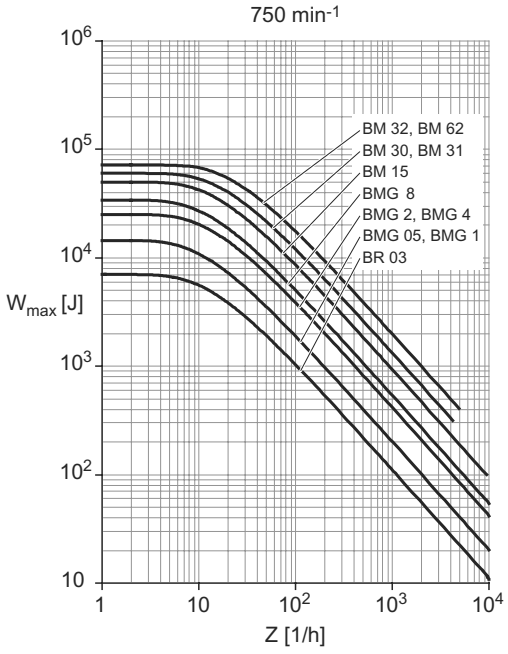

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Figure 50: Maximum permitted work done per cycle at 750 min-1

Emergency stop features

In hoist applications it is mandatory that the limits of the permitted maximum work done (maximum work done see diagrams on page 108) are not exceed even in the event of an emergency stop. In other applications, such as travel drives with reduced braking torques, much higher values can be permitted from case to case. Please consult SEW-EURODRIVE if you need values for increased brake work for emergency stops.

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. Refer to the "Brakes and Accessories" manual for detailed information about SEW-EURODRIVE brakes.

The brake control systems are either installed directly on the motor in the wiring space or in the control cabinet. In case of motors of thermal class 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 integrated 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./BMG02, DR63../BR	BG	without control unit[1)]
DT71../BMG - DV100../BMG	BG	BS
DV112../BMG - DV225../BM	BGE	BSG
DV250../BMG - DV280../BMG	BGE	-

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

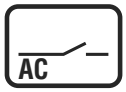
Brake control system in the wiring space

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 on an inverter, the supply voltage for the brake must be supplied separately.

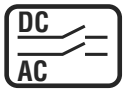
In addition, it is necessary bear in mind that brake application is delayed by the residual voltage of the motor in case the brake is powered by the motor supply voltage. The brake application time t_2I stated in the technical data for cut-off in the AC circuit applies to a separate supply only.

7.11 Block diagrams of brake control systems (→ GM)

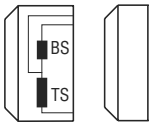
Key



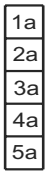
Cut-off in the AC circuit
(standard brake application)



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

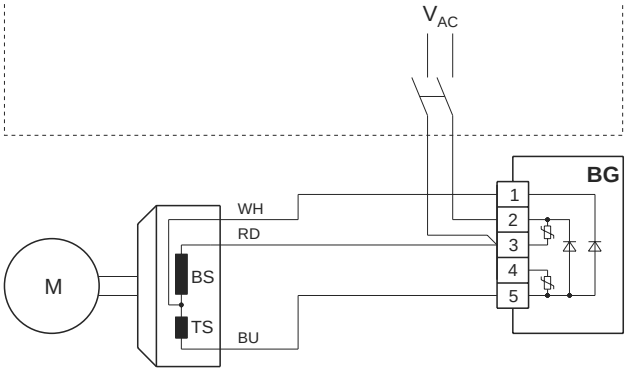
Motor with star connection

Color coding according to IEC 757:

WH	White
RD	Red
BU	Blue
BN	Brown
BK	Black

Control cabinet limit

BG, BMS



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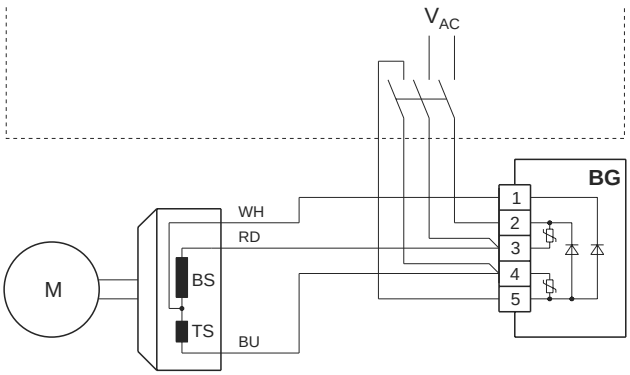

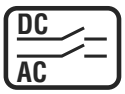

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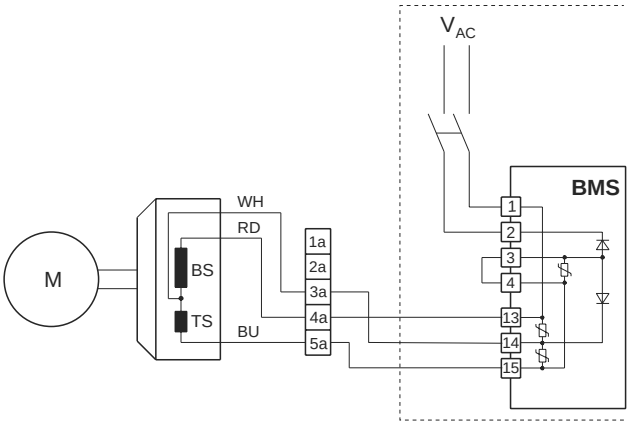

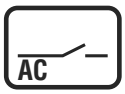

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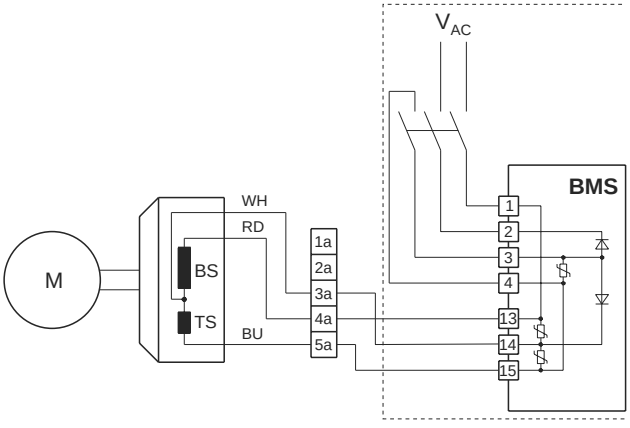

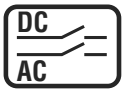

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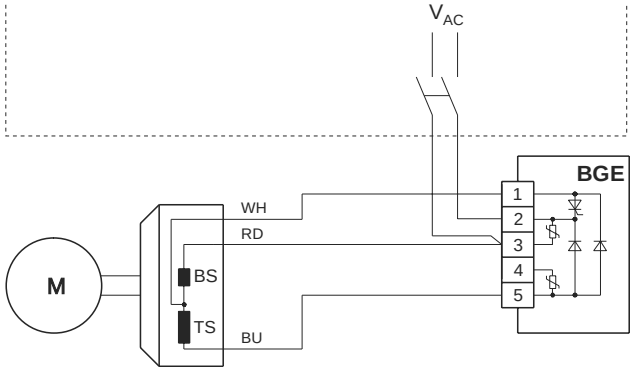
BGE, BME



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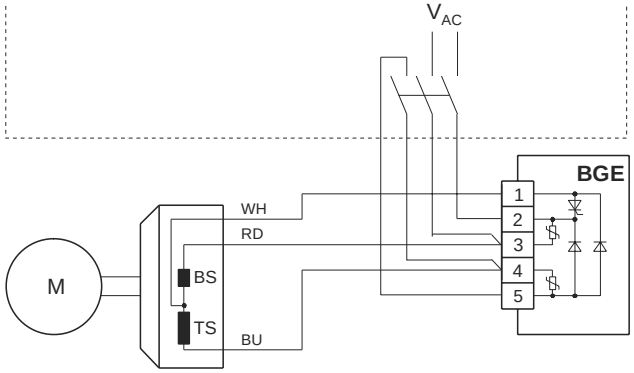

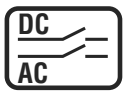

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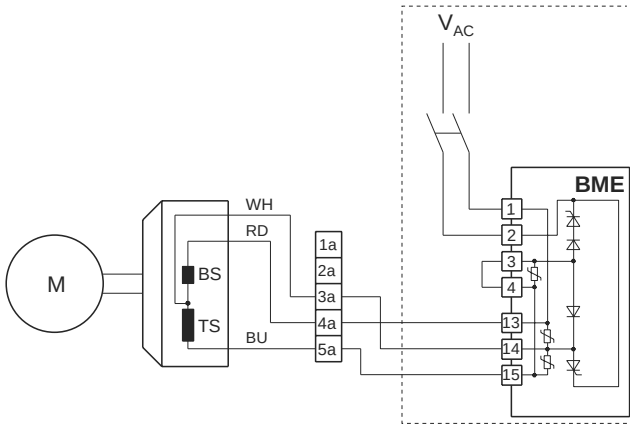

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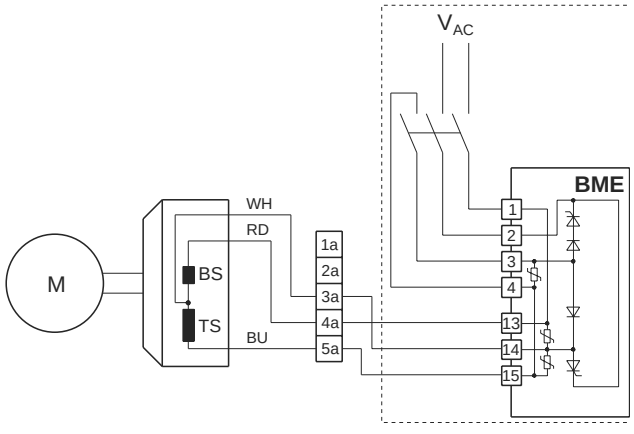

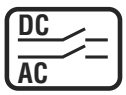

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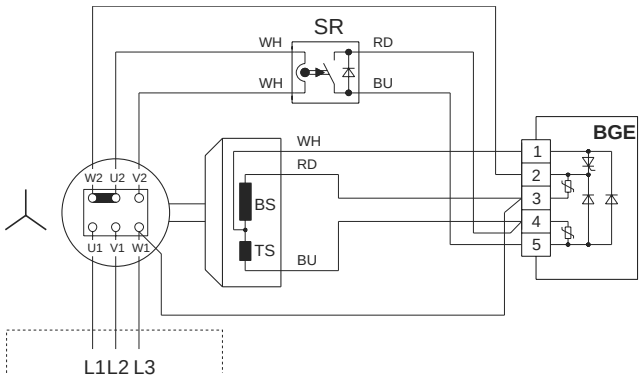

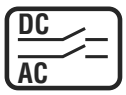

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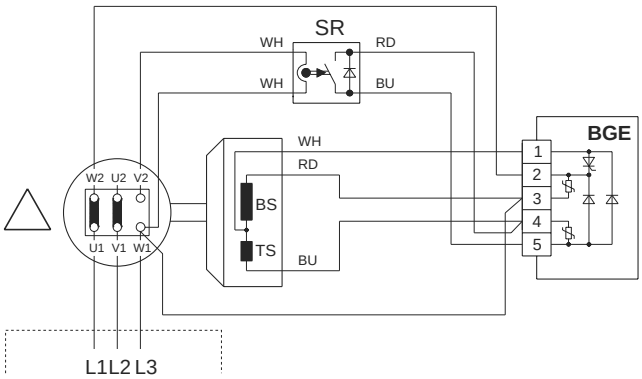

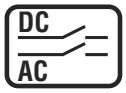

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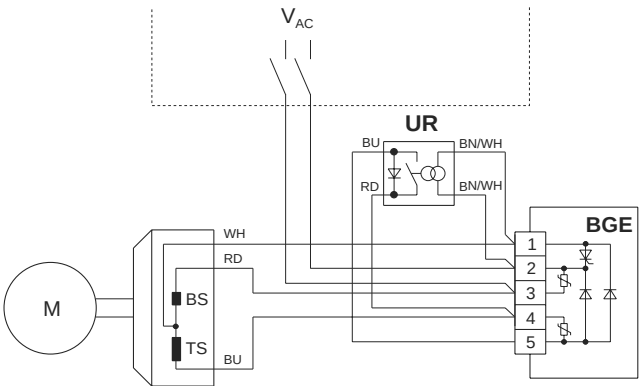
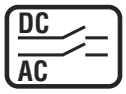
BUR





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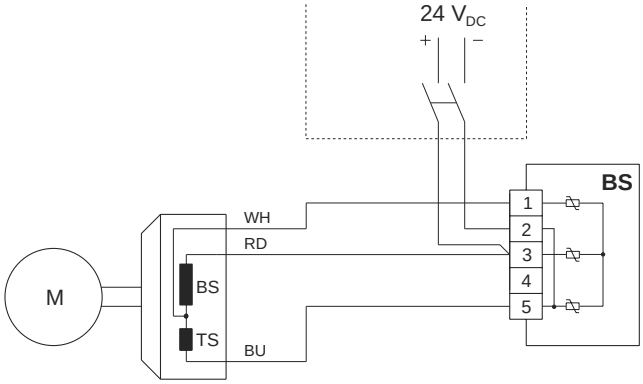
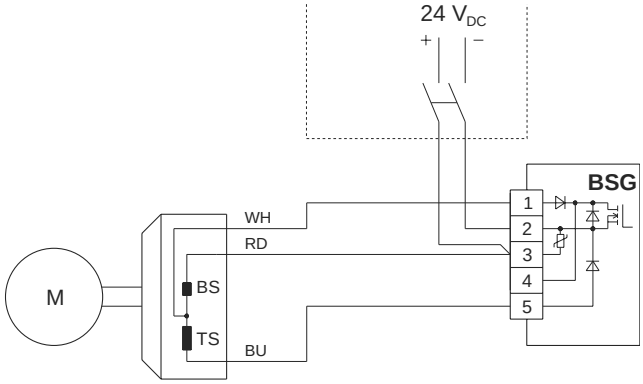
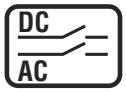
BS



03271AXX

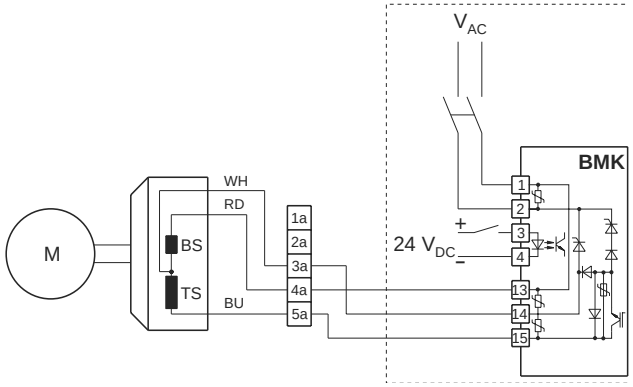
BSG

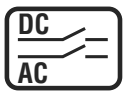




01539BXX

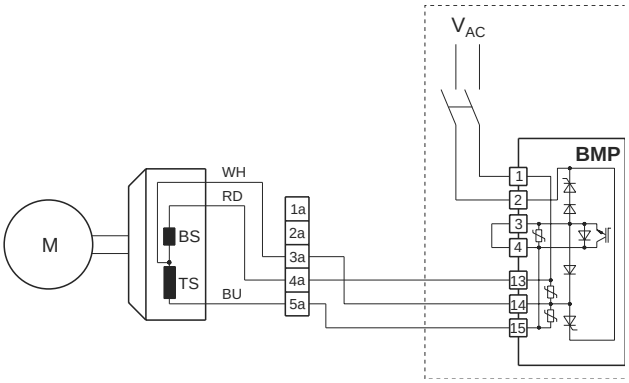
BMK





03252AXX

BMP, BMH



AC

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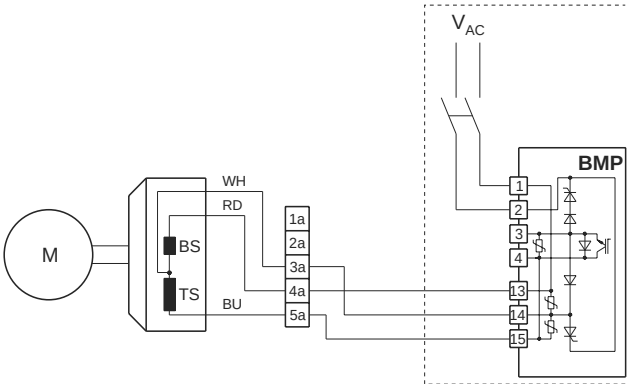
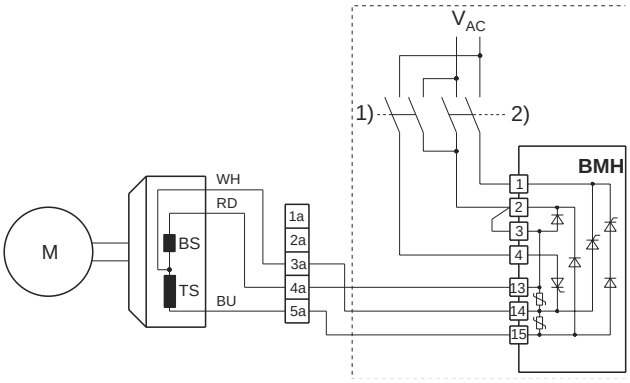


DC
AC

01541BXX

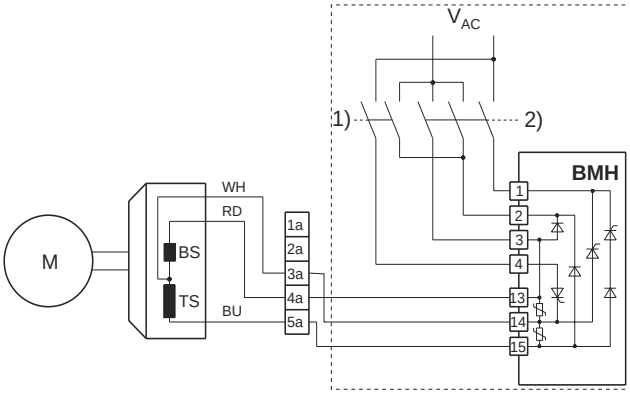
1) Heating
2) Ventilating



AC

01542BXX

1) Heating
2) Ventilating



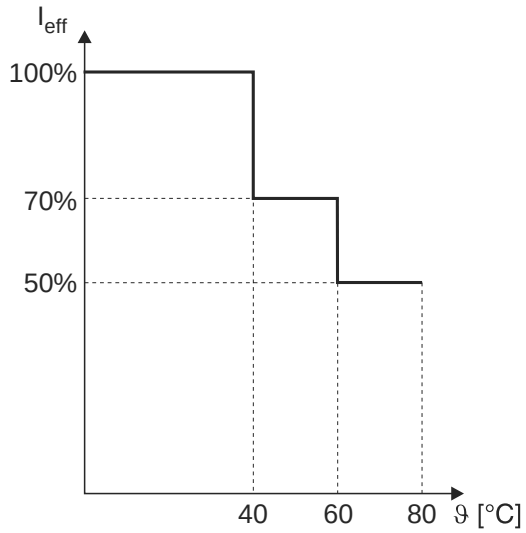
DC
AC

01543BXX

7.12 Plug connectors (→ GM)

Contact rating depending on the temperature

The "Technical data" tables for plug connectors (→ "Gearmotors" price catalog/catalog) lists electrical current values for the maximum permitted contact load (= max. contact load) of the plug connectors. These current values are valid for ambient temperatures of up to max. 40 °C. Higher ambient temperatures apply for reduced current values. The following illustration shows the permitted contact load as a function of the ambient temperature.



06443AXX

Figure 51: Permitted contact load as a function of the ambient temperature

I_{eff} = Current value of the maximum permitted contact load, 100% = value as listed in the "Technical data" table (→ "Gearmotors" price catalog/catalog).

ϑ = Ambient temperature

IS integrated plug connector

03075AXX

Figure 52: AC gearmotor with IS integrated plug connector

On request, AC (brake) motors DR63 and DT71 ... DV132S.. can be supplied with the integrated, 12-pole IS plug connector instead of the standard terminal box. The upper section of the IS plug connector (mating connector) is included in the scope of delivery. The IS plug connector is particularly compact and offers the following connection options:

- Motor, single-speed or two-speed pole changing
- Brake
- Temperature monitoring (TF or TH)

As with the terminal box, the cable run with the IS integrated plug connector can be from four different directions offset at 90°.

- IS requires a clearance of 30 mm for removing the connector.
- **For DR63 brake motors with IS size 1 only:** Only brake control systems BG1.2, BG2.4, BSR and BUR can be accommodated in the IS plug connector. Other brake control systems must be installed in the control cabinet.

Plug connectors AS.., AC.., AM.., AB.., AD.., AK..

05664AXX

Figure 53: AC motor with ASE.. plug connector

The plug connector systems AS.., AC.., AM.., AB.., AD.. and AK.. are based on plug connector systems from Harting.

- AS.., AC.. → Han 10E / 10ES
- AM.., AB.., AD.., AK.. → Han Modular®

The plug connectors are located at the side of the terminal box. They are locked either using two clamps or one clamp on the terminal box.

UL approval has been granted for the plug connectors.

The mating connector (sleeve housing) with socket contacts is not included in the scope of delivery.

AS.., AC..

The ten contacts of the AS.. and AC.. plug connector systems connect the motor winding (6 contacts), the brake (2 contacts) and the thermal motor protection (2 contacts). You can connect both motors with single speed and two-speed pole-changing motors.

Types AS.. and AC.. differ as follows:

- AS = Spring cages
- AC = Crimp contacts and shortened contacts for thermal motor protection

Applies to AS.1 and AC.1:

For brakemotors, you can select the version with brake control in the terminal box only. In this case, the disconnection in the DC circuit has to take place electronically using BSR or BUR.

The ASD.. and ASE.. types with single clip longitudinal closure correspond to the DESINA regulation issued by the Association of German Machine Tool Manufacturers (VDW).

Note the following point:

- Cable entry in position 1 is not available for motor sizes DT71... DV132S.

AM.., AB.., AD.., AK..

Plug connectors AM.., AB.., AD.. and AK.. can be used for connecting both single speed motors and two-speed pole-changing motors.

With brake motors, the brake control system can be either located in the terminal box or in the control cabinet. All versions of the brake control system are possible.

APG.. plug connector

03198AXX

Figure 54: AC motor with plug connector APG..

The plug connector with the designation APG.. is based on a plug manufactured by Phoenix Contact from the PlusCon VC product series. The mating connector is not included in the scope of delivery.

Four power contacts of the plug connector are used for the three phases and the PE connection. Other control contacts are used for the three brake lines and the thermal motor protection.

The APG.. is installed on the narrow side of the motor terminal box. The terminal box can be turned by 4 × 90 °.

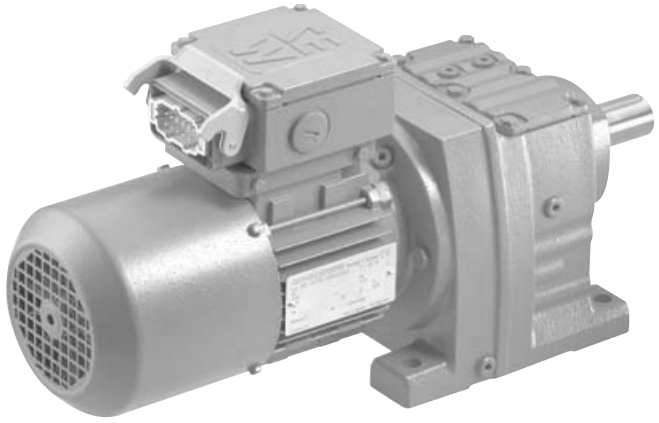
The plug connector permits an easily separable hybrid cable connection between the motor/brake motor and a field distributor with an integrated MOVIMOT® inverter or a suitable third-party field control module (e.g. the Drive Shuttle open-loop speed controller made by Phoenix Contact, type IBS IP 400 VFD...).

The APG.. plug connector can also be used as standard to connect the motor for mains operation. The brake rectifier must be installed in the control cabinet in this case.

Pre-fabricated cable

SEW-EURODRIVE offers a pre-fabricated cable for connecting the field distributor and the AC (brake) motor with option APG4. The cable is prefabricated in steps of half a meter up to a maximum length of five meters. The cable can be ordered from SEW-EURODRIVE. Specify the required length (max. 5 m).

Plug connector ASK1



51277AXX

Figure 55: AC motor with ASK1 plug connector

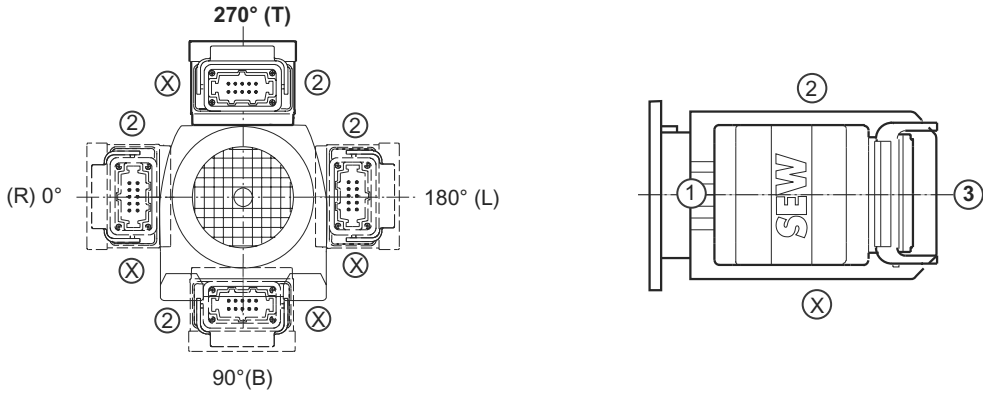
The installed ASK1 plug connector system is based on the Han 10ES plug connector system made by Harting. The plug connector is located at the side of the terminal box. It is locked in place on the terminal box with a clamp.

The ASK1 plug connector system is used for ECOFAST® compliant AC (brake) motors DT71 ... DV132S.

Refer to the ECOFAST® system manual for detailed information and project planning notes on ECOFAST®.

Position of terminal box with ASK1 plug connector

As standard, ECOFAST®-compliant AC (brake) motors are supplied with the terminal box in position 270°/3. Please contact SEW-EURODRIVE in case of other positions.



51738AXX

Figure 56: Terminal box position of ASK1

Optional carrier plate for ASK1 (part number 187390 3)

A motor-integrated installation of an ECOFAST® compliant switching or control unit requires a carrier plate onto which the switching or control unit is plugged. The carrier plate can be used regardless of the motor size.

51278AXX

Figure 57: Carrier plate option for ASK1

7.13 Encoders and prefabricated cables for encoder connection (→ GM)

Tachometer

Various types of tachometers are available for installation on DT../ DV.. AC motors as standard depending on the application and motor size. With rare exceptions, the encoders can be combined with other optional components installed in the motor, such as brakes and forced cooling fans.

Overview of encoders

Name	For motor	Encoder type	Shaft	Specification	Power supply	Signal
EH1T	DR63	Encoders	Hollow shaft	1024 pulses/revolution	DC 5 V controlled	TTL/RS-422
EH1S					9 V_{DC} ... 26 V_{DC}	1 V_{SS} sin/cos
EH1R						TTL/RS-422
ES1T	DT71...DV100		Spreadshaft		DC 5 V controlled	TTL/RS-422
ES1S					9 V_{DC} ... 26 V_{DC}	1 V_{SS} sin/cos
ES1R						TTL/RS-422
ES2T	DV112...DV132S				DC 5 V controlled	TTL/RS-422
ES2S					9 V_{DC} ... 26 V_{DC}	1 V_{SS} sin/cos
ES2R						TTL/RS-422
EV1T	DT71...DV280		Solid shaft		DC 5 V controlled	TTL/RS-422
EV1S					10 V_{DC} ... 30 V_{DC}	1 V_{SS} sin/cos
EV1R						TTL/RS-422
ES12	DT71...DV100	Encoder	Spreadshaft	A+B tracks	9 V_{DC} ... 26 V_{DC}	Either 1 or 2 pulses/revolution
ES22	DV112...DV132S					
ES16	DT71...DV100					6 pulses/revolution
ES26	DV112...DV132S					
NV11	DT71...DV100	Proximity sensor	Solid shaft	A track	10 V_{DC} ... 30 V_{DC}	1 pulse/revolution, normally open contact
NV21				A+B tracks		
NV12	DT71...DV132S			A track		2 pulses/revolution, normally open contact
NV22				A+B tracks		
NV16				A track		6 pulses/revolution, normally open contact
NV26				A+B tracks		
AV1Y	DT71...DV280	Multi-turn-absolute encoder	Solid shaft	-	10 V_{DC} ... 30 V_{DC}	MSSI interface and 1 V_{SS} sin/cos
ES3H	DT71...DV100	Single-turn HIPERFACE® encoder	Spreadshaft	-	7 V_{DC} ... 12 V_{DC}	RS-485 interface and 1 V_{SS} sin/cos
ES4H	DV112...DV132S					
AS3H	DT71...DV100	Multi-turn HIPERFACE® encoder				
AS4H	DV112...DV132S					
AV1H[1)]	DT71...DV280	Multi-turn HIPERFACE® encoder	Solid shaft	-	7 V_{DC} ... 12 V_{DC}	RS-485 interface and 1 V_{SS} sin/cos

1) recommended encoder for operation with MOVIDRIVE® MDX61B with option DEH11B

Encoder connection

When connecting the encoders to the inverters, always follow the operating instructions for the relevant inverter and the wiring diagrams supplied with the encoders!

- Maximum line length (inverter – encoder): 100 m with a cable capacitance ≤ 120 nF/km
- Conductor cross section: 0.20 ... 0.5 mm^2
- Use shielded cable with twisted pair conductors and apply shield over large area on both ends :
  - At the encoder in the cable gland or in the encoder plug
  - To the inverter on the electronics shield clamp or to the housing of the sub D plug
- Install the encoder cables separately from the power cables, maintaining a distance of at least 200 mm.
- Encoder with cable gland: Observe the permitted diameter of the encoder cable to ensure that the cable gland functions correctly.

Incremental encoder (Encoder)

The encoders from SEW-EURODRIVE are available as incremental encoders with 1024 signals/revolution or as encoder with 1, 2 or 6 pulses/revolution.

Hollow shaft encoder and spreadshaft encoder

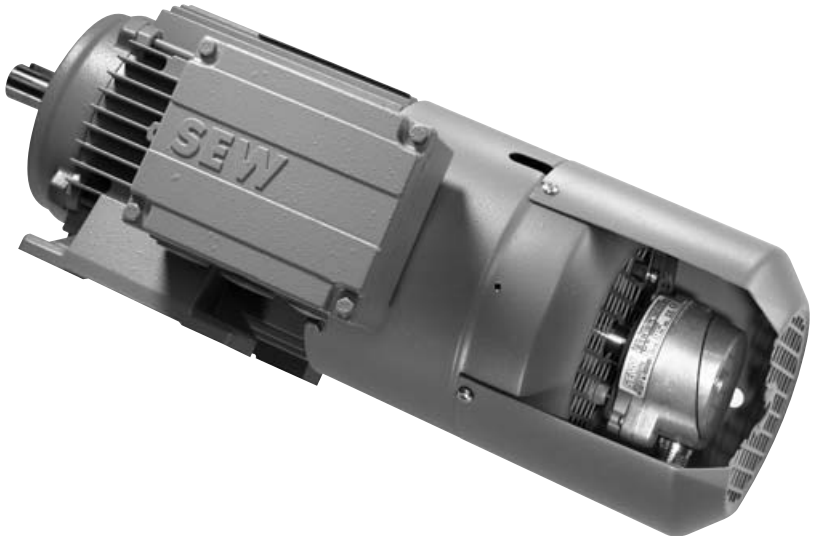


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Figure 58: Encoder with spreadshaft

Solid shaft encoder

01935CXX

Figure 59: AC motor with solid shaft encoder and forced cooling fan VR

Encoder mounting adapter

The motors can be equipped with various encoder mounting adapters for installing encoders from different manufacturers.

01949CXX

Figure 60: AC motor with encoder mounting adapter EV1A and forced cooling fan VR

The encoder is attached to the EV1A (synchro flange) using three encoder mounting clamps (bolts with eccentric discs) for 3 mm flange thickness.

Absolute encoder

The absolute encoders AV1Y from SEW-EURODRIVE are combination encoders. They contain a multi-turn absolute encoder and a high-resolution sinusoidal encoder.

03078BXX

Figure 61: AC motor with absolute encoder and forced cooling fan VR

HIPERFACE® encoder

HIPERFACE® encoders are available as single-turn or multi-turn combination encoder. They contain an absolute encoder and a high-resolution sinusoidal encoder.

59810AXX

Figure 62: AC motor with HIPERFACE® encoder AS3H

Proximity sensor

The proximity sensors from SEW-EURODRIVE can be used to easily and inexpensively monitor whether the motor is turning. If a two-track proximity sensor is used, the direction of rotation of the motor can also be detected. Proximity sensors can either be installed on the side of the fan guard (motor maintains original length) or as spreadshaft encoder on the motor.

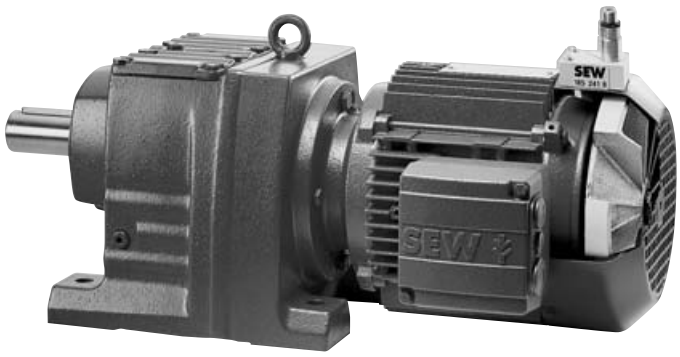

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Figure 63: Proximity sensor NV..

The connection cable is not included in the scope of delivery. Contact your retailer to purchase the appropriate connection cable.

Prefabricated cables for encoder connection

SEW-EURODRIVE offers prefabricated cables for simple and reliable connection of encoder systems. It is necessary to differentiate between cables used for fixed installation or for use in cable carriers. The cables are prefabricated in 1 m steps to the required length.

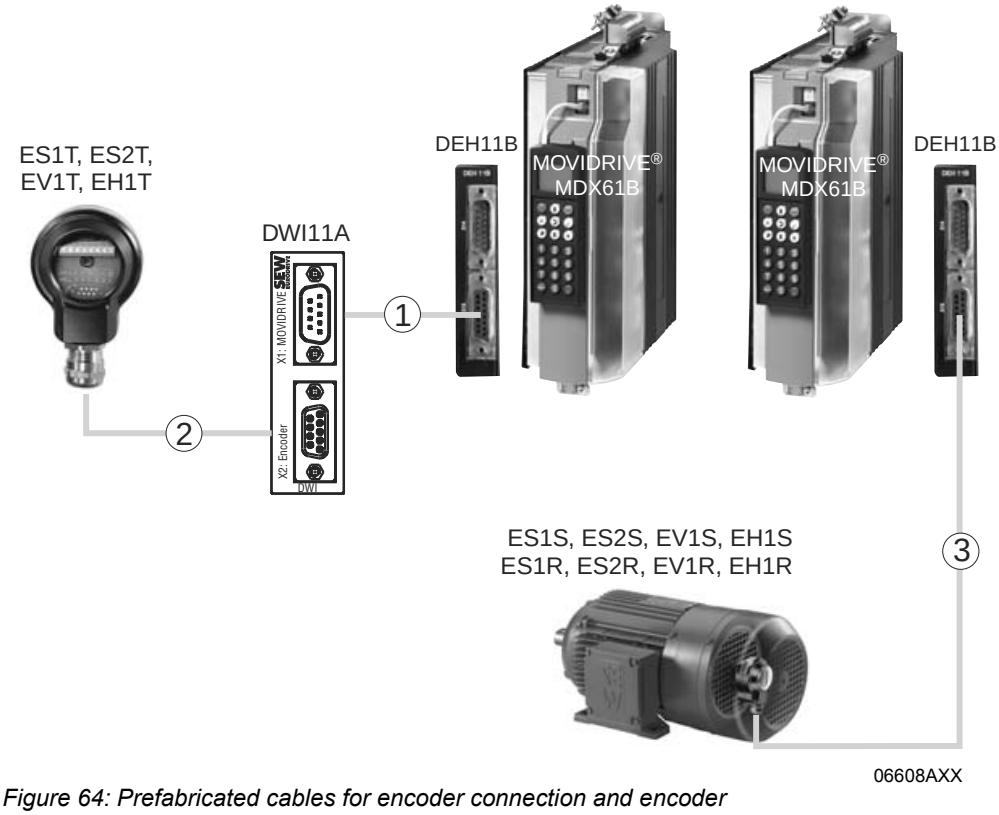

Figure 64: Prefabricated cables for encoder connection and encoder

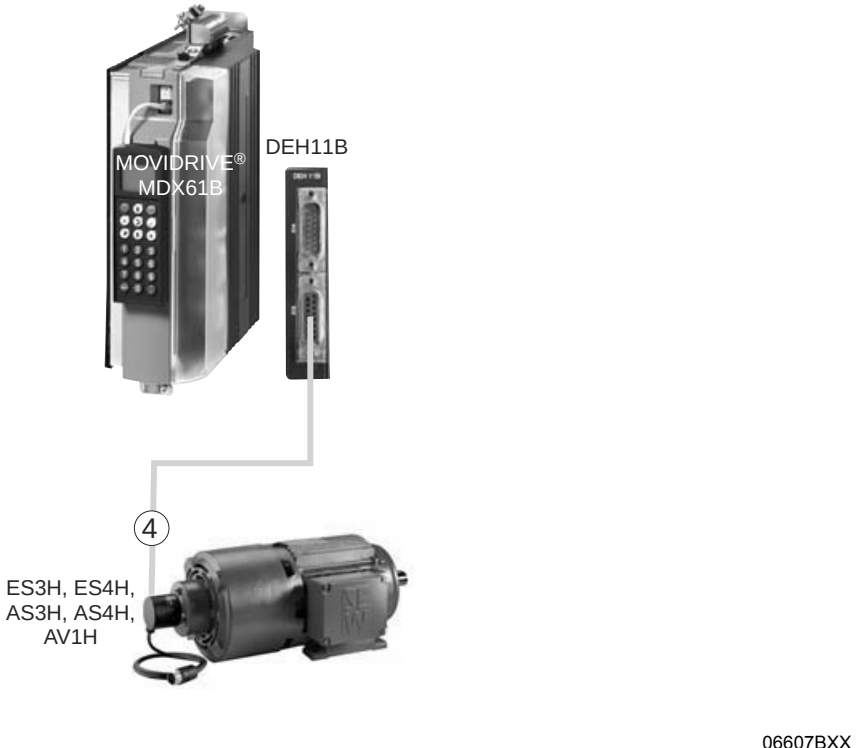

Figure 65: Prefabricated cables for HIPERFACE® encoders

(1) Prefabricated cables for encoder connection:

Part number	**817 957 3**
Installation	Fixed installation
for encoders with 5 V voltage supply	ES1T, ES2T, EV1T, EH1T
Cable cross section	4×2×0.25 mm^2 (AWG23) + 1×0.25 mm^2 (AWG23)
Conductor colors	A: Yellow (YE) A: Green (GN) B : Red (RD) B : Blue (BU) C : Pink (PK) C : Gray (GY) UB: White (WH) ⊥: Brown (BN) Sensor cable: Violet (VT)
Manufacturer and type **Lapp** **Helukabel**	 Unitronic Li2YCY (TP) Paar-Tronic-CY
For inverter	MOVIDRIVE® MDX61B with DEH11B option
Connection **on the DWI11A** **on the inverter**	 with 9-pin sub D socket with 15-pin sub D plug

(2) Prefabricated cables for incremental TTL encoders with 5V voltage supply:

Part number	**198 829 8**	**198 828 X**
Installation	Fixed installation	Cable carrier installation
for encoder	ES1T, ES2T, EV1T, EH1T via DWI11A and cable 817 957 3	
Cable cross section	4×2×0.25 mm^2 (AWG23) + 1×0.25 mm^2 (AWG23)	
Conductor colors	A: Yellow (YE) A: Green (GN) B : Red (RD) B : Blue (BU) C : Pink (PK) C : Gray (GY) UB: White (WH) ⊥: Brown (BN) Sensor cable: Violet (VT)	
Manufacturer and type **Lapp** **Helukabel**	 Unitronic Li2YCY (TP) Paar-Tronic-CY	 Unitronic LiYCY Super-Paar-Tronic-C-PUR
For inverter	MOVIDRIVE® MDX61B with DEH11B option	
Connection on **encoder / motor** **DWI11A**	 with conductor end sleeves Connect the violet conductor (VT) with the encoder at UB. with 9-pin sub D plug	

③ Prefabricated cables for incremental TTL sensors and sin/cos encoders (TTL sensors and sin/cos encoders) with 24V voltage supply:

Part number	1332 459 4	1332 458 6
Installation	Fixed installation	Cable carrier installation
for encoder	ES1S, ES2S, EV1S, EH1S, ES1R, ES2R, EV1R, EH1R	
Cable cross section	4×2×0.25 mm² (AWG23) + 1×0.25 mm² (AWG23)	
Conductor colors	A: Yellow (YE) A: Green (GN) B : Red (RD) B : Blue (BU) C : Pink (PK) C : Gray (GY) UB: White (WH) ⊥: Brown (BN) Sensor cable: Violet (VT)	
Manufacturer and type **Lapp** **Helukabel**	 Unitronic Li2YCY (TP) Paar-Tronic-CY	 Unitronic LiYCY Super-Paar-Tronic-C-PUR
For inverter	MOVIDRIVE® MDX61B with DEH11B option	
Connection on **encoder / motor** **Inverter**	 with conductor end sleeves Cut off the violet conductor (VT) of the cable at the encoder end. with 15-pin sub D plug	

④ Prefabricated cables for HIPERFACE® encoders:

Part number	1332 453 5	1332 455 1
Installation	Fixed installation	Cable carrier installation
for encoder	ES3H, ES4H, AS3H, AS4H, AV1H	
Cable cross section	6 × 2 × 0.25 mm² (AWG 23)	
Conductor colors	cos+: Red (RD) cos-: Blue (BU) sin+: Yellow (YE) sin-: Green (GN) D+: Black (BK) D-: Violet (VT) TF/TH/KTY+: Brown (BN) TF/TH/KTY-: White (WH) GND: Gray/pink + pink (GY-PK + PK) U_S: Red/blue + gray (RD-BU + GY)	
Manufacturer and type	Lapp, PVC/C/PP 303 028 1	Nexans, 493 290 70
For inverter	MOVIDRIVE® MDX61B with DEH11B option	
Connection on **encoder / motor** **Inverter**	 With 12-pin round connector plug (Intercontec, type ASTA021NN00 10 000 5 000) with 15-pin sub D plug	

Extension cables for HIPERFACE® cables

Part number	199 539 1	199 540 5
Installation	Fixed installation	Cable carrier installation
Cable cross section	6 × 2 × 0.25 mm² (AWG 23)	
Conductor colors	→ HIPERFACE® cable	
Manufacturer and type	Lapp, PVC/C/PP 303 028 1	Nexans, 493 290 70
Connection on **encoder / motor** **HIPERFACE® cable**	 With 12-pin round connector plug (Intercontec, type ASTA021NN00 10 000 5 000) with 12-pin round connector plug (Intercontec, type AKUA20)	

7.14 Forced cooling fan

Forced cooling fan VR, VS and V

The motors can be equipped with a forced cooling fan if required. A forced cooling fan is usually not required for mains operated motors in continuous duty. SEW-EURODRIVE recommends a forced cooling fan for the following applications:

- Drives with high starting frequency
- Drives with additional flywheel mass Z (flywheel fan)
- Inverter drives with a setting range ≥ 1:20
- Inverter drives that have to generate rated torque even at low speed or at standstill.

Following figure shows a typical speed-torque characteristic for a dynamic inverter drive, for example with MOVIDRIVE® MDX61B with DEH11B option in CFC operating mode.

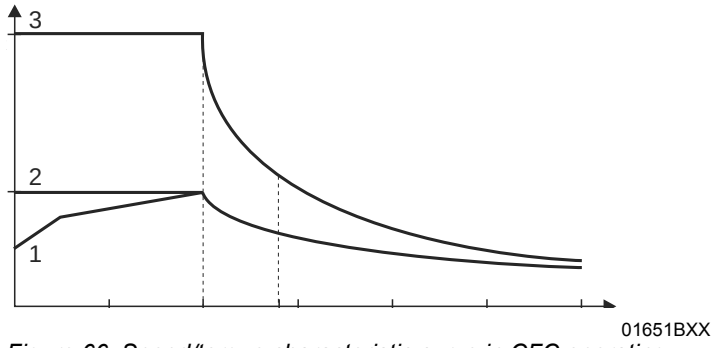

Figure 66: Speed/torque characteristic curve in CFC operating mode

M_N	= Rated torque of the motor	1	= With self-cooling
M_{max}	= Maximum torque of the motor	2	= With forced cooling
n_{base}	= Rated speed (transition speed) of the motor	3	= Maximum torque

A forced cooling fan must be used if the load torque in the 0 ... n_{Eck} is above curve 1. The motor becomes thermally overloaded without forced cooling.

VR forced cooling fan

The VR forced cooling fan is supplied with a voltage of DC 24 V. For voltage supply with 1 × AC 230 V, SEW-EURODRIVE offers switched-mode power supply type UWU52A (part number 188 181 7).

Switched-mode power supply UWU52A is mounted on a support rail in the control cabinet.

Combination with encoders

Forced cooling fans can be combined with the following motor encoders:

Motor encoder	For motor size	Forced cooling fan		
		VR	VS	V
ES1T, ES1R, ES1S, ES3H, AS3H	71 ... 100	•	-	-
ES2T, ES2R, ES2S, ES4H, AS4H	112 ... 132S	•	-	-
EV1T, EV1R, EV1S	71 ... 132S	•	•	-
EV1T, EV1R, EV1S	132M ... 280	-	-	•
AV1Y, AV1H	71 ... 132S	•	•	-
AV1Y, AV1H	132M ... 280	-	-	•

VR forced cooling fans can be combined with any encoder from SEW-EURODRIVE. Forced cooling fans VS and V can be combined with encoders with solid shaft only. In DV250M/DV280S motors, the motor encoder can only be installed in conjunction with a forced cooling fan.

7.15 Additional flywheel mass Z, backstop RS and protection canopy C (→ GM)

Additional flywheel mass Z (high inertia fan)

The motor can be equipped with additional flywheel mass, the flywheel fan, to achieve smooth startup and braking behavior of mains operated motors. In this way, the motor obtains additional mass moment of inertia J_Z. The flywheel fan is replaced by a normal fan. The outer motor dimensions remain the same. It can be installed on motors with and without a brake. For technical data of the "flywheel fan Z" option, refer to the "Gearmotors" price catalog"catalog.

Note the following points:

- Check the starting frequency. Multiply the permitted no-load starting frequency Z_0 with the factor 0.8 or use a forced cooling fan.
- Use the total mass moment of inertia $J_{ges} = J_{mot} + J_Z$ at the motor end. You find the values for the mass moments of inertia J_{Mot} and J_Z in the section "Technical data of additional flywheel mass Z and backstop RS."
- Counter-current braking and moving against the stop are not permitted.
- Not available in vibration grade R.
- **Only for DT80..:** The flywheel fan for DT71.. (part number 182 232 2) is used in combination with a solid shaft encoder or a mounting device for a solid shaft encoder . In this case $J_Z = 20 \bullet 10^{-4}$ kgm^2 must be used for configuration.

Backstop RS

The mechanical backstop RS is used for protecting equipment against reverse movement when the motor is switched off. For technical data of the "backstop Z" option, refer to the "Gearmotors" price catalog"catalog.

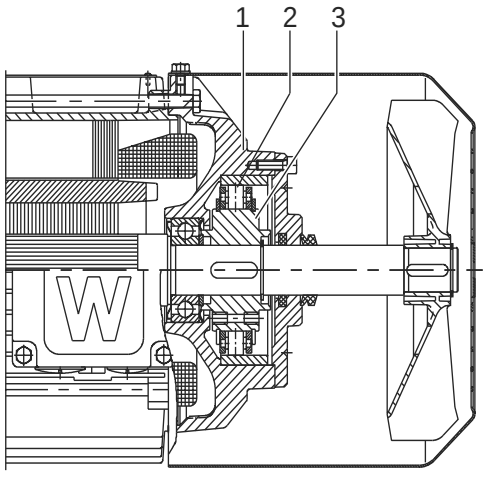

Figure 67: Design of the RS backstop

1 Non drive-end bearing shield
2 Wedge element train
3 Driver

Specify the direction of rotation for the motor or gearmotor when placing your order. CW rotation means the output shaft rotates clockwise as viewed onto its face end and is blocked to prevent it from turning counterclockwise. The vice versa principle applies to counterclockwise direction of rotation.

Protection canopy C

Liquids and/or solid foreign objects can penetrate the air outlet openings of motors in a vertical mounting position with their input shaft pointing downwards. SEW-EURODRIVE offers the motor option protection canopy C for this purpose.

All explosion-proof AC motors and AC brake motors in a vertical mounting position with their output shaft pointing downwards come equipped with protection canopy C. The same applies to motors in a vertical mounting position installed in the open.

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Figure 68: AC motor with protection canopy C

7.16 Low-noise fan guard

The noise of the gearmotor is usually louder due to the fan guards of the drives.

SEW-EURODRIVE offers the "low-noise fan guard" option for motor sizes DT71D to DV132S. This guard can reduce the noise level by about 3 db(A) compared to the standard version.

This option is only available for motors and brake motors. The "low-noise fan guard"option cannot be combined with encoders or forced cooling fans. The option is indicated by the letters "LN" in the type designation.

7.17 MOVIMOT® (→ MM)

General notes

Note the following points during project planning for MOVIMOT® AC motors:

- For detailed project planning notes, technical data and information on the communication of MOVIMOT® via fieldbus interfaces or RS-485, refer to the system folder "Decentralized Installation" (MOVIMOT®, MOVI-SWITCH®, Communication and Supply Interfaces).
- The use of MOVIMOT® for hoist applications is limited. Please contact SEW-EURODRIVE to inquire about suitable solutions with MOVITRAC® or MOVIDRIVE®.
- The suitable MOVIMOT® gearmotor is selected with regard to the speed, power, torque and spatial conditions of the application (see the selection tables in the "MOVIMOT® Gearmotors price catalog / catalog). The options are then determined depending on the control type.

Functional description

MOVIMOT® is the combination of an AC (brake) motor and a digital frequency inverter in the power range 0.37 ... 3 kW. It is the perfect match for decentralized drive configurations.

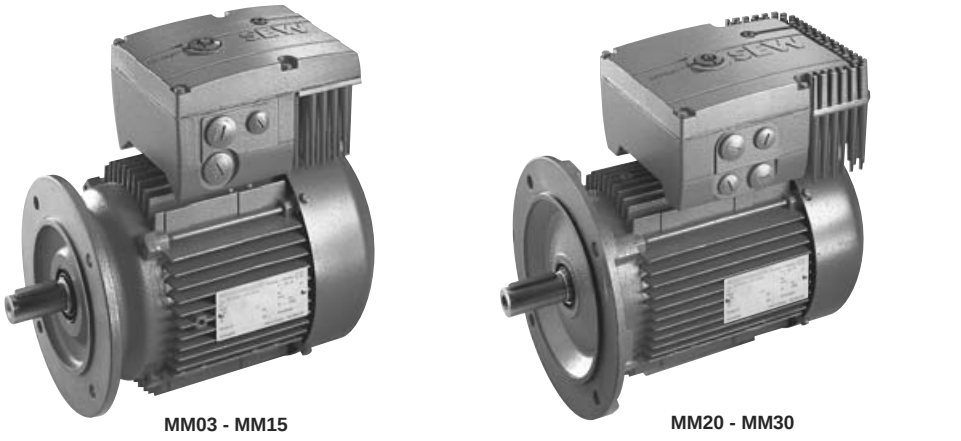

Figure 69: MOVIMOT® AC motor

Features of MOVIMOT®

MOVIMOT® is the ideal solution for a variety of decentralized drive tasks. The following functional description provides an overview of the most important features:

- MOVIMOT® is a gearmotor with integrated digital frequency inverter in the power range from 0.37 to 3.0 kW and integrated brake management.
- MOVIMOT® is available for the supply voltages 3 × 200...240 V, 50/60 Hz and 3 × 380...500 V, 50/60 Hz.
- MOVIMOT® is available for rated speeds of 1400 min^{-1} and 2900 min^{-1}.
- The brake coil is used as braking resistor in motors with mechanical brake; an internal braking resistor will be a standard component of MOVIMOT® units for motors without brake.
- MOVIMOT® is available in two designs:
  - MM..C-503-**00**: Standard version
  - MM..C-503-**30**: with integrated AS-interface

- Control takes place via binary signals, via the serial interface RS-485 or optionally via all commercial fieldbus interfaces (PROFIBUS, INTERBUS, DeviceNet, CANopen or AS-interface).
- Overview of MOVIMOT® functions (all versions):
  - Clockwise, counterclockwise operation
  - Changeover between two fixed setpoints
  - Setpoint f1 can be scaled
  - Ready signal to controller
  - Diagnostics of MOVIMOT® via status LED
  - Additional functions for specific applications
- Additional functions of version with integrated AS-interface
  - Addressing via M12 (AS-interface address 1-31)
  - Connection option for two external sensors
  - Additional LED for AS-interface status
  - Additional diagnostic interface via modular jack 4/4 plug connector
- MOVIMOT® can be supplied with UL approval (UL listed) on request.
- Design in dust /explosion protection 3D for zone 22 possible.

Advantages of MOVIMOT®

MOVIMOT® offers the following advantages:

- Compact design
- Interference-free connection between inverter and motor
- Closed design with integrated protection functions
- Inverter cooling independent of the motor speed
- No space required in the control cabinet
- Optimum presetting of all parameters for the expected application
- Compliance with EMC standards EN 50 081 (interference suppression level A) and EN 50 082
- Easy installation, startup and maintenance
- Easy to service for retrofitting and replacement

MOVIMOT® can be used to equip extensive systems or can be integrated into existing systems. MOVIMOT® is also the electronic replacement for pole-changing motors or mechanical variable speed drives.

MOVIMOT® is available as motor, brake motor, gearmotors or geared brake motor in many different standard versions and mounting positions.

Connection technology MOVIMOT® standard design

Overview

MOVIMOT® MM..C-503-00 is supplied without plug connector if not specified otherwise in the order. The plug connectors listed in the following table are preferred components. For other types, please contact SEW-EURODRIVE.

Order designation	Function	Terminal box design	Manufacturer designation
MM../AVT1	RS-485	Standard	M12 x 1 round plug connector
MM../RE.A/ASA3 RE1A = MM03-15 RE2A = MM22-3X	Power	Modular	Harting HAN® 10 ES pin element (built-on housing with two clips)
MM../RE.A/ASA3/AVT1 RE1A = MM03-15 RE2A = MM22-3X	Power/RS-485	Modular	Harting HAN® 10 ES pin element (built-on housing with two clips) + M12 x 1 round plug connector
MM../RE.A/AMA6 RE1A = MM03-15 RE2A = MM22-3X	Power/RS-485	Modular	Harting HAN® modular pin element (built-on housing with two clips)
MM../RE.A/AMD6 RE1A = MM03-15 RE2A = MM22-3X	Power/RS-485	Modular	Harting HAN® modular pin element (built-on housing with one clip)

Terminal box design:

The modular terminal box offers the following functions compared to the standard terminal box:

- The position of the cable entries/plug connectors can later be turned to the opposite side (see "MOVIMOT®" operating instructions).
- Integration of brake control systems (see Sec. "Options")

Possible plug connector positions

The following positions are possible for plug connectors:

Plug connector	Possible positions
AVT1	X (standard)
	2
RE.A/ASA3	X (standard)
	2
RE.A/ASA3/AVT1	ASA3 = X (standard) + AVT1 = X (standard)
	ASA3 = 2 + AVT1 = 2
	ASA3 = X + AVT1 = 2
	ASA3 = 2 + AVT1 = X
RE.A/AMA6 **RE.A/AMD6**	X (standard)
	2

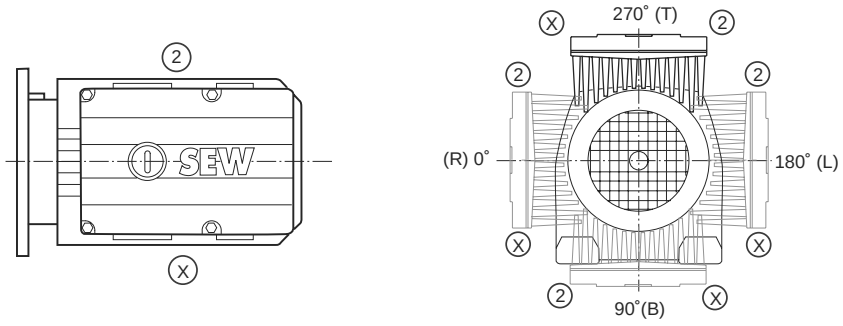

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Figure 70: Possible plug connector positions

MOVIMOT® operating modes

4Q operation of motors with mechanical brake

- The brake coil is used as braking resistor in 4Q operation.
- No external braking resistor may be connected.
- Brake voltage is generated internally within the unit, which means it is mains-independent.

Resistance and assignment of the brake coil:

Motor	Brake	Resistance of the brake coil[1)]	
		MOVIMOT® with 380–500 V_{AC} input voltage	MOVIMOT® with 200–240 V_{AC} input voltage
DT71	**BMG05**	277 Ω (230 V)	69,6 Ω (110 V)
DT80	**BMG1**	248 Ω (230 V)	62,2 Ω (110 V)
DT90	**BMG2**	216 Ω (230 V) / 54.2 Ω (110 V)	54,2 Ω (110 V)
DV100/DT100	**BMG4**	43.5 Ω (110 V)	27.3 Ω (88 V)

1) Rated value measured between the red connection (terminal 13) and the blue connection (terminal 15) at 20°C, temperature-dependent fluctuations in the range -25% / +40 % are possible.

Regenerative load capacity of the brake coil (MOVIMOT® with 380 – 500 V_{AC} supply voltage)

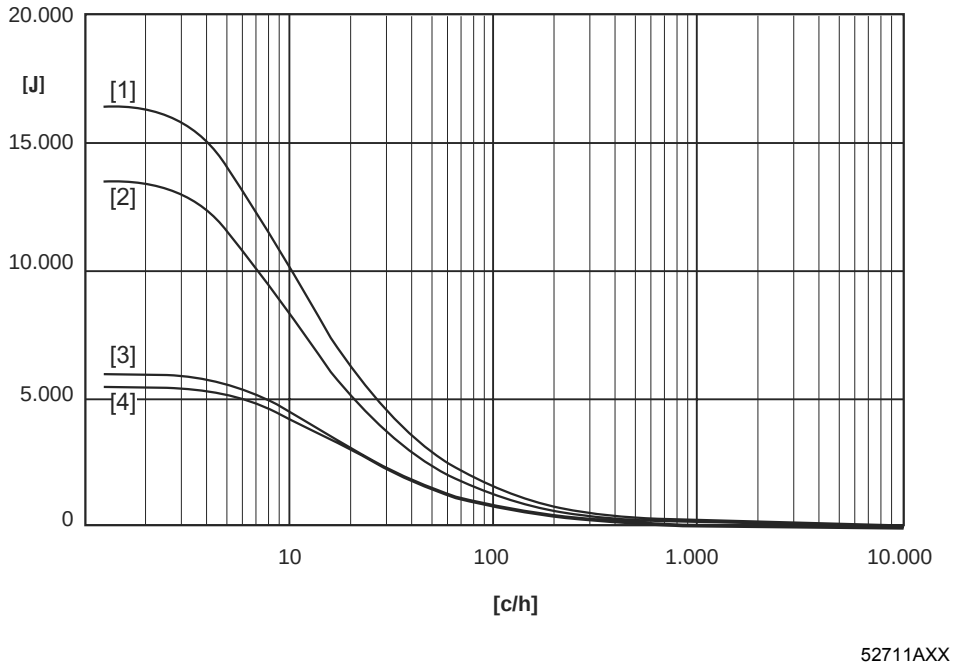

Figure 71: Regenerative load capacity

[c/h] Cycles per hour
[1] BMG2/BMG4 (110 V)
[2] BMG2 (230 V)
[3] BMG1 (230 V)
[4] BMG05 (230 V)

Regenerative load capacity of the brake coil (MOVIMOT® with 200...240 V_{AC} supply voltage)

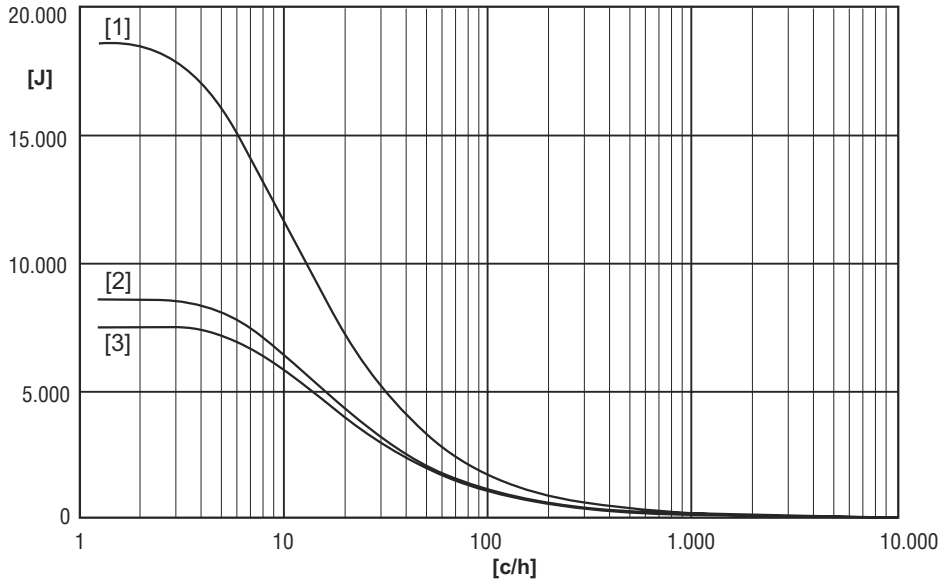

Figure 72: Regenerative load capacity

[c/h]	Cycles per hour
[1]	BMG2 (110 V), BMG4 (88 V)
[2]	BMG1 (110 V)
[3]	BMG05 (110 V)

4Q operation with integrated braking resistor BW..

- The brake resistor is integrated in the terminal box of MOVIMOT® as standard in motors without mechanical brake.
- 4Q operation with integrated braking resistor is recommended for applications in which the level of regenerative energy is low.
- The resistor protects itself (reversible) against regenerative overload by changing abruptly to high resistance and no longer consuming any more energy. The inverter then switches off and signals an overvoltage error (error code 04).
- With retrofit kits, field distributors or P2.A option for mounting the MOVIMOT® unit in close proximity to the motor, the braking resistor must be ordered separately.

Assignment of internal braking resistors:

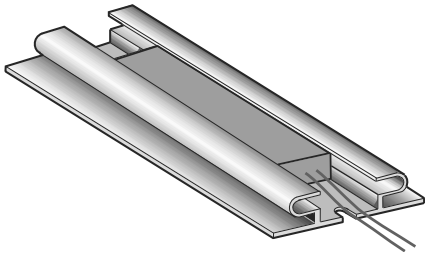

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Figure 73: Integrated BW.. braking resistor

MOVIMOT®	MOVIMOT® type	Braking resistor	Part number
with input voltage 380–500 V_{AC}	MM03..MM15	BW1	822 897 3[1)]
			800 621 0[2)]
	MM22..MM3X	BW2	823 136 2[1)]
			800 622 9[2)]
with input voltage 200–240 V_{AC}	MM03..MM07	BW3	800 623 7[2)]
	MM11..MM22	BW4	800 624 5[2)]

1) Two screws M4 x 8, included in delivery

2) Retaining screws not included in scope of delivery

Regenerative load capacity of internal braking resistors:

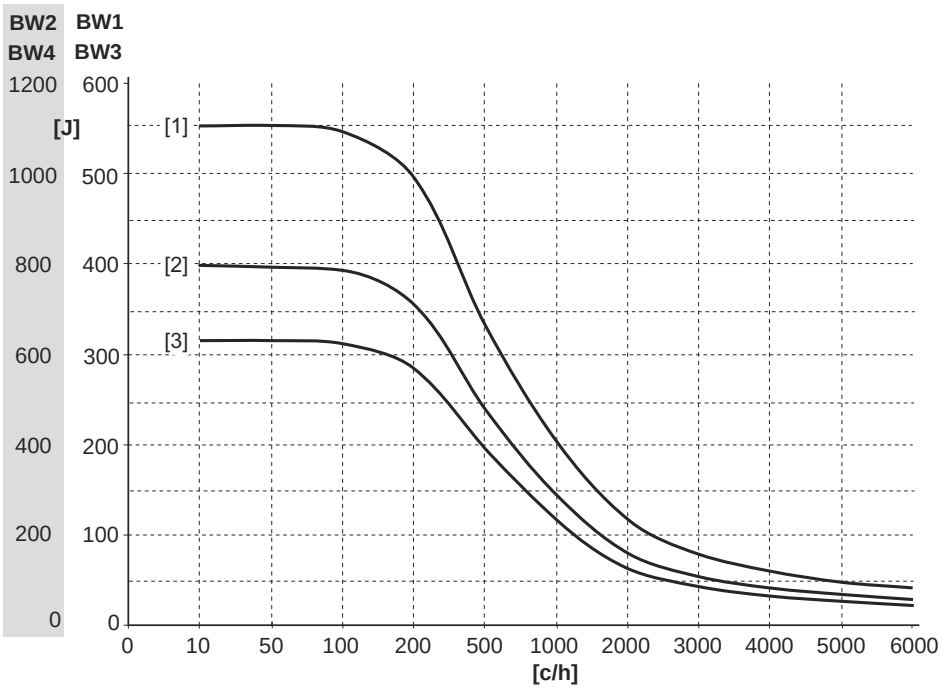


Figure 74: Regenerative load capacity

[c/h]	Cycles per hour
[1]	Brake ramp 10 s
[2]	Brake ramp 4 s
[3]	Brake ramp 0.2 s

4Q operation with brake and external braking resistor

- 4Q operation with external braking resistor is recommended for applications in which the level of regenerative energy is high.
- External braking resistors are only permitted with brake motors in combination with brake control BGM/BSM.
- When using external braking resistors and BGM/BSM brake control, MOVIMOT® special functions must be activated. Refer to the MOVIMOT® operating instructions for more information.

Assignment of external braking resistors:

MOVIMOT®	MOVIMOT® type	Braking resistor	Part number
with input voltage 380–500 V_{AC}	MM03..MM15	BW200-003/K-1.5	828 291 9
		BW200-005/K-1.5	828 283 8
		BW150-010	802 285 2
	MM22..MM3X	BW100-003/K-1.5	828 293 5
		BW100-005/K-1.5	828 286 2
		BW068-010	802 287 9
		BW068-020	802 286 0

Power diagrams of external braking resistors:

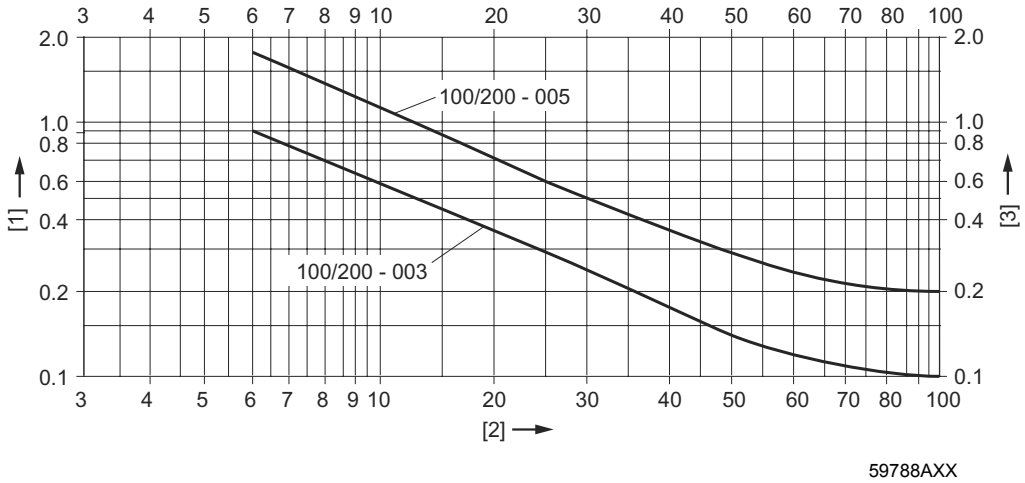


Figure 75: Power diagrams of braking resistors BW100-003, BW200-003, BW100-005 and BW200-005

[1] Short-term power in KW
[2] Cyclic duration factor cdf in %
[3] Continuous power 100 % cdf in KW

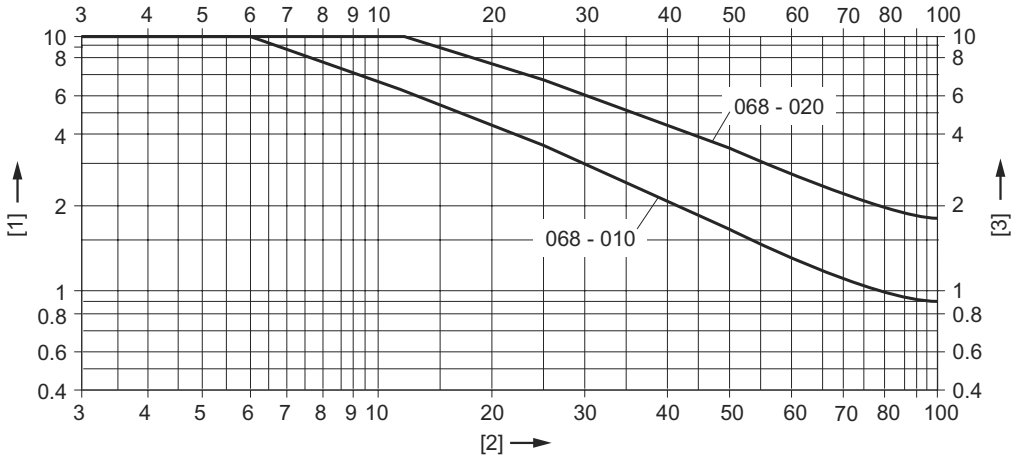


Figure 76: Power diagrams of braking resistors BW068-010 and BW068-020

[1] Short-term power in KW
[2] Cyclic duration factor cdf in %
[3] Continuous power 100 % cdf in KW

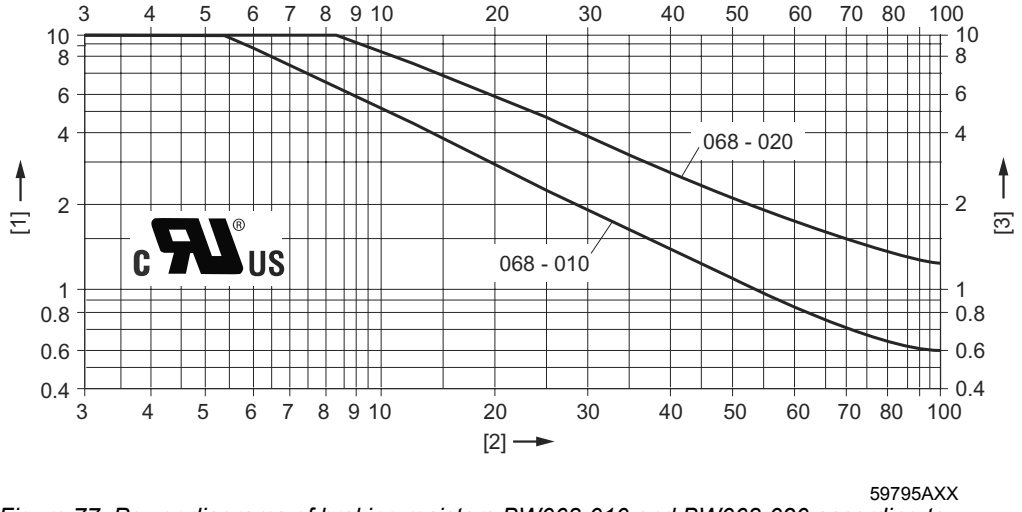


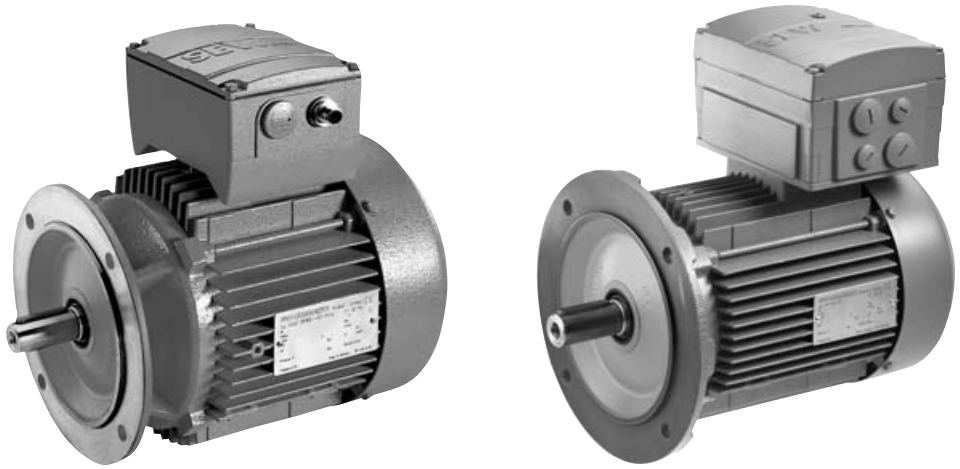
Figure 77: Power diagrams of braking resistors BW068-010 and BW068-020 according to UL approval

[1] Short-term power in KW
[2] Cyclic duration factor cdf in %
[3] Continuous power 100 % cdf in KW

7.18 MOVI-SWITCH® (→ GM)

MOVI-SWITCH® is the gearmotor with integrated switching and protection function. Single speed AC (brake) motors in sizes DT71 to DV100 can be combined with all appropriate gear units in the modular concept as part of the MOVI-SWITCH® product range. For detailed information on MOVI-SWITCH®, refer to the system folder "Decentralized Installation" (MOVIMOT®, MOVI-SWITCH®, Communication and Supply Interfaces).

MSW-1E MSW-2S



MSW1E_MSW2S

Figure 78: Gearmotor with MOVI-SWITCH®

Advantages of MOVI-SWITCH®

MOVI-SWITCH® offers the following advantages:

- The circuit breaker and protection functions are completely integrated, saving control cabinet space and cabling.
- Robust and compact, resulting in space-saving installation.
- Use MOVI-SWITCH® to operate motors in the voltage range 3 × 380 ... 500 V, 50 / 60 Hz.
- AC motors and AC brake motors with the same connection configuration, therefore simple installation.

2 versions

Two MOVI-SWITCH® versions are available: one for operation with one direction of rotation (MSW-1E); one for operation with direction of rotation reversal (MSW-2S).

The mains and control connections are the same for motors with or without brake.

MSW-1E

MOVI-SWITCH® MSW-1E is switched on and off without changing direction by means of a short circuit-proof star bridge switch. A thermal winding monitor (TF) is also integrated, which acts directly on the switch.

MSW-2S

The direction of rotation is reversed in MOVI-SWITCH® MSW-2S using a reversing relay combination with a long service life. Supply system monitoring, phase-sequence monitoring, brake control, circuit breaker and protection functions are grouped together in the controller. The various operating states are indicated by the diagnostic LED.

The pin assignment for clockwise direction of rotation (CW) is compatible with that of MSW-1E. The integrated AS-interface connection is compatible with MLK11A.

Available combinations

The following MOVI-SWITCH® AC motors and AC brake motors can be combined with all suitable gear unit types, mounting positions and versions in accordance with the selection tables for gearmotors.

Motor size	Power [kW] with pole number			
	2	4	6	8
DT71D.. (/BMG)/TF/MSW..	0.55	0.37	0.25	0.15
DT80K.. (/BMG)/TF/MSW..	0.75	0.55	0.37	-
DT80N.. (/BMG)/TF/MSW..	1.1	0.75	0.55	0.25
DT90S.. (/BMG)/TF/MSW..	1.5	1.1	0.75	0.37
DT90L.. (/BMG)/TF/MSW..	2.2	1.5	1.1	0.55
DV100M.. (/BMG)/TF/MSW..	3.0	2.2	1.5	0.75
DV100L.. (/BMG)/TF/MSW..	-	3.0	-	1.1

Order information

Note the following points when ordering AC (brake) motors or gearmotors with MOVI-SWITCH®:

- Voltage for winding in ⅄ connection only.
- Only two brake voltages are possible:
  - Motor voltage / $\sqrt{3}$ or
  - motor voltage.
- Position of the terminal box preferably 270°. Please consult SEW-EURODRIVE for other positions.

Block diagram

MSW-1E

Theory of operation of MOVI-SWITCH® MSW-1E:

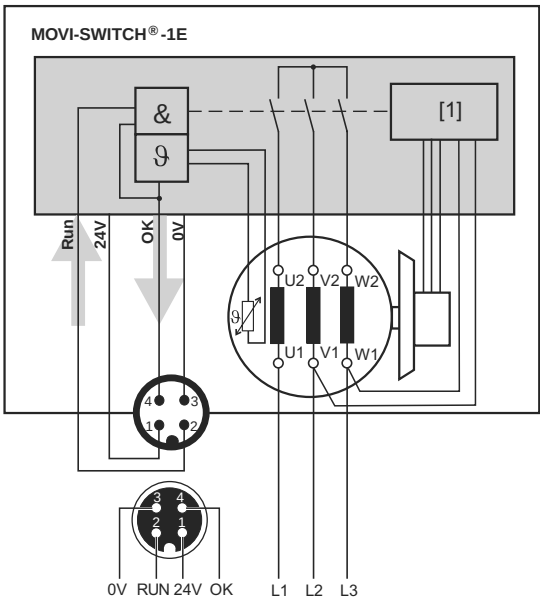


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Figure 79: Block diagram MOVI-SWITCH® MSW-1E

[1] Brake control

MSW-2S with binary control

Theory of operation of MOVI-SWITCH® MSW-2S with binary control:

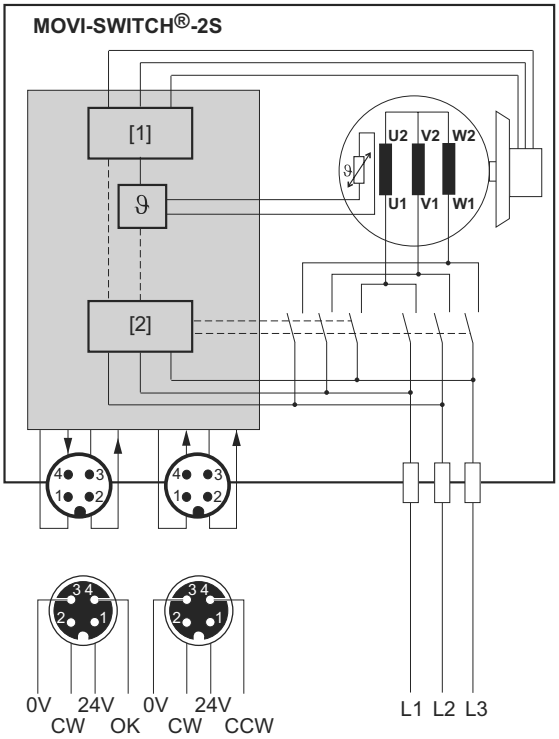

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Figure 80: Block diagram MOVI-SWITCH® MSW-2S with binary control

[1] Brake control

[2] Rotating field detection

MSW-2S with AS-interface control

Theory of operation of MOVI-SWITCH® MSW-2S with AS-interface control:

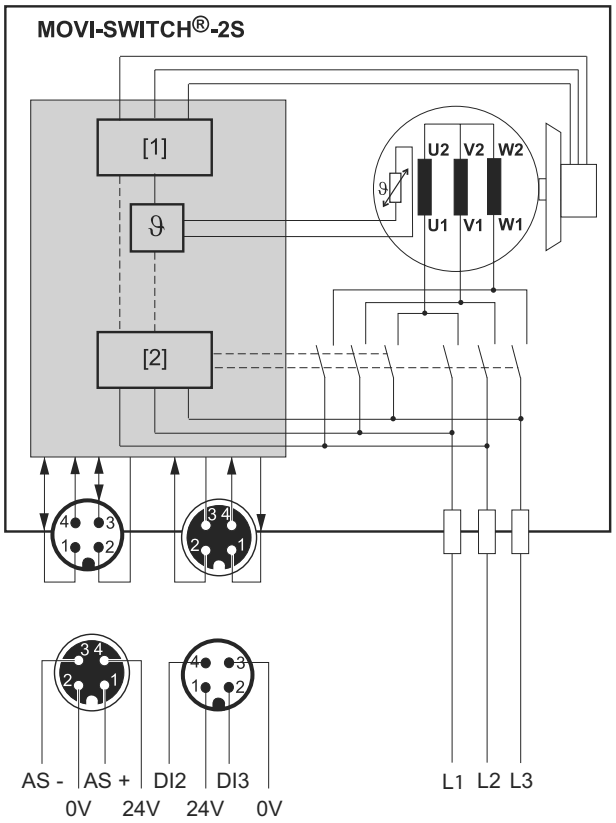

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Figure 81: Block diagram of MOVI-SWITCH® MSW-2S with AS-interface control

[1] Brake control

[2] Rotating field detection

AS AS-interface

7.19 WPU smooth pole-change unit (→ GM)

Normal pole-changing motors cannot switch from high to low speed without jerks unless special measures are taken. In order to limit the occurring regenerative braking torque, either the voltage is reduced to a lower value at the moment of changeover through chokes, a transformer or dropping resistors, or only 2-phase switchover takes place. All mentioned measures involve additional installation effort and switchgear. A time relay causes the voltage to return to normal voltage conditions. The relay is set empirically. The WPU smooth pole-change unit operates purely electronically.

Function

The changeover command blocks a phase of the mains voltage using a triac and in this way reduces the shifting down torque to about a third. As soon as the synchronous speed of the high-pole winding is reached, the third phase is activated again in a current optimized manner.

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Figure 82: Smooth pole-change unit WPU

Advantages of WPU

- Load independent and wear-free
- No energy loss which means high efficiency
- No restriction on start-up and rated torque and no restriction on the motor starting frequency
- Minimum wiring
- Suitable for any standard motor

Technical data

Type	WPU 1001	WPU 1003	WPU 1010	WPU 2030
Part number	825 742 6	825 743 4	825 744 2	825 745 0
For pole-changing motors with rated current at low speed I_N in S1 continuous running duty	0.2 ... 1 A_{AC}	1 ... 3 A_{AC}	3 ... 10 A_{AC}	10 ... 30 A_{AC}
For pole-changing motors with rated current at low speed I_N in S3 intermittent periodic duty 40/60% cdf	0.2 ... 1 A_{AC}	1 ... 5 A_{AC}	3 ... 15 A_{AC}	10 ... 50 A_{AC}
Rated supply voltage U_{mains}	$2 \times 150...500\ V_{AC}$			
Supply frequency f_{mains}	50/60 Hz			
Rated current in S1 continuous running duty I_N	1 A_{AC}	3 A_{AC}	10 A_{AC}	30 A_{AC}
Ambient temperature ϑ_{Umg}	-15 ... +45°C			
Enclosure	IP20			
Weight	0.3 kg	0.3 kg	0.6 kg	1.5 kg
Mechanical design	DIN rail housing with screw connections			Control cabinet rear panel

7.20 ECOFAST® compliant AC motors DT/DV..ASK1 (→ GM)

Under the trademark ECOFAST® (Energy and Communication Field Installation System), filed by the Automation and Drives (A&D) division of SIEMENS, the system partners offer an open and innovative solution in the area of decentralization without control cabinet for automation and drive engineering. This approach is based on the completely decentralized installation and direct installation of the units on the machines. In addition to the communication via PROFIBUS-DP and AS-interface, power supply of the consumers in the ECOFAST® system is also branch-like via power bus. All automation, drive and installation components are combined to form a standard complete solution with standardized connection technology for data and power transfer. The project planning tool ECOFAST® ES (Engineering Software) supports the power-specific dimensioning of a system. Communication via standardized fieldbuses and consistent use of standardized interfaces based on the DESINA specification make ECOFAST® an open, non-proprietary and flexible system solution. Refer to the "ECOFAST®" system manual for detailed information about ECOFAST®.

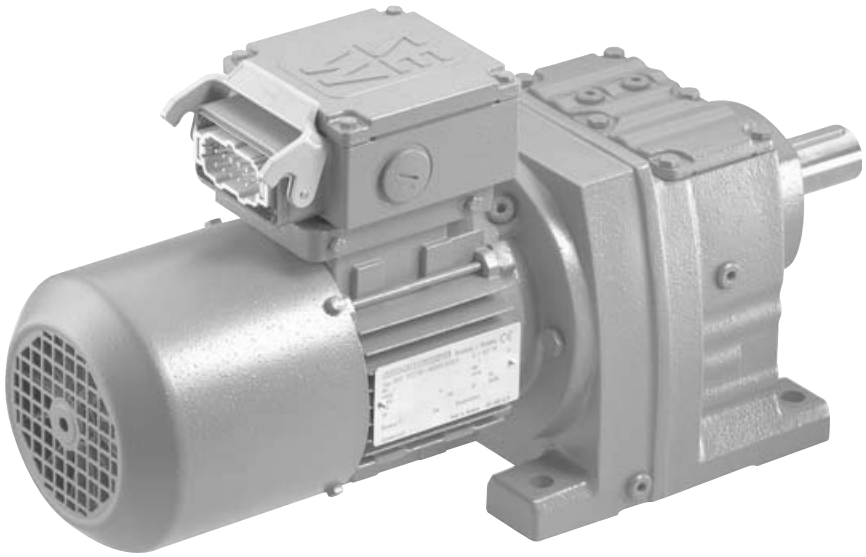

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Figure 83: AC motor with ASK1 plug connector

Function description

ECOFAST® compliant AC motors from SEW-EURODRIVE are equipped with the plug connector option ASK1 as standard. The plug connector ASK1 consists of:

- HAN10ES plug connector with pin insert, single-bracket easy lock and EMC frame.
- Possibility of installing an optional carrier plate for attaching switchgear and control units.

Possible combinations

Almost all gearmotor combinations based on the "Gearmotors" catalog can be supplied in ECOFAST® certified design. The following restrictions apply:

- Motor sizes DT71 to DV132S
- Motor voltage \always 230/400 V and 50 Hz
- Only motors with one speed
- Brake option: Brake voltage always 400 V_{AC}
- Temperature sensor option: only TF
- Brake control system option: only BGE, BG and BUR
- Only thermal classes "B" and "F"

Example unit designation

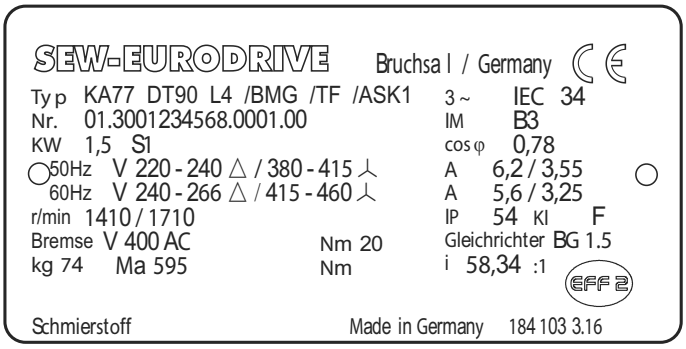

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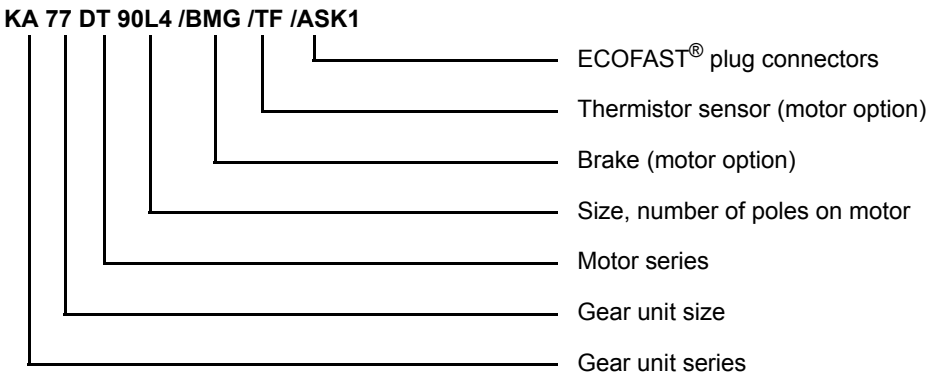
Figure 84: Example of nameplate for "AC motor with ASK1"



Structure of the serial number (example):