

Motors- Basic principles

Expertise, performance, innovation

ebmpapst

The engineer's choice

ebmpapst



As a leading supplier of ventilation and drive engineering technology, ebm-papst is a highly respected engineering partner in many industries. With over 15,000 different products, we can provide the right solution for almost any application. And all our fans and drives are reliable, quiet-running and energy-efficient.

Six things that make us the ideal partner:

Our systems expertise.

Naturally you will always want the best solution for every project. This can only be achieved by considering the ventilation and drive engineering aspects as a whole. And that is precisely what we do: With motor technology that sets standards, sophisticated electronics and aerodynamically optimized designs – all from a single supplier and perfectly matched. These system solutions create potential for unique synergy effects worldwide. What's more: They save you a lot of work, so you can concentrate on your main area of expertise.

The ebm-papst spirit of invention.

Alongside our wide range of products, our team of 600 specialist engineers and technicians at our four German plants in Muldingen, Landshut, St. Georgen and Lauf is always on hand to develop customized solutions to suit your requirements. Just get in touch with us to discuss your latest project.

Our cutting-edge technology.

Our pioneering, ground-breaking development work in the field of highly efficient EC technology gives us a massive lead over other motor manufacturers. Almost all our products can be supplied with GreenTech EC technology today, offering you unrivalled advantages: Greater efficiency, maintenance-free and longer service life, noise minimization, intelligent control characteristics and unrivaled energy efficiency with savings of up to 80% as compared to conventional AC technology. Use our cutting-edge technology to your competitive advantage.

Proximity to our customers.

ebm-papst has 57 sales offices worldwide, 47 of which are subsidiaries with an extensive network of sales representatives and distributors. So there is always someone nearby to contact, who speaks your language and is familiar with your market.

Our quality standards.

It goes without saying that you can depend on the top quality of our products, because we employ an uncompromising quality management system at every stage of the process. This is underscored, for example, by our certification according to the international standards DIN EN ISO 9001, ISO/TS 16949-2 and DIN EN ISO 14001.

Our sustainable approach.

Assuming responsibility for the environment, for our employees and for society is an integral part of our corporate philosophy. That is why we develop products with an eye to maximum environmental compatibility and employ particularly resource-preserving production methods. We promote environmental awareness among our junior staff and are actively involved in sporting, cultural and educational activities. That's what makes us one of the "better companies" – and a better partner for you.

Motors



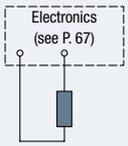
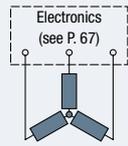
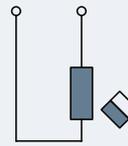
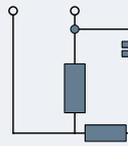
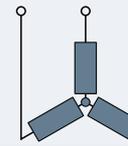
Motors from ebm-papst

Motors from ebm-papst with both AC and EC technology are based on the successful external rotor principle, which means that the rotor rotates around the internal stator.

This offers a variety of advantages:

- Space-saving design thanks to integrated bearings and direct installation in impeller
- Reduced load on the bearings as a result of more accurate balancing, as all rotating elements are permanently connected to one another
- Longer service life, as the motor-impeller unit is located directly in the air flow
- ebm-papst motors employing GreenTech EC technology attain optimum values in terms of efficiency and noise characteristics.

ebm-papst motors >

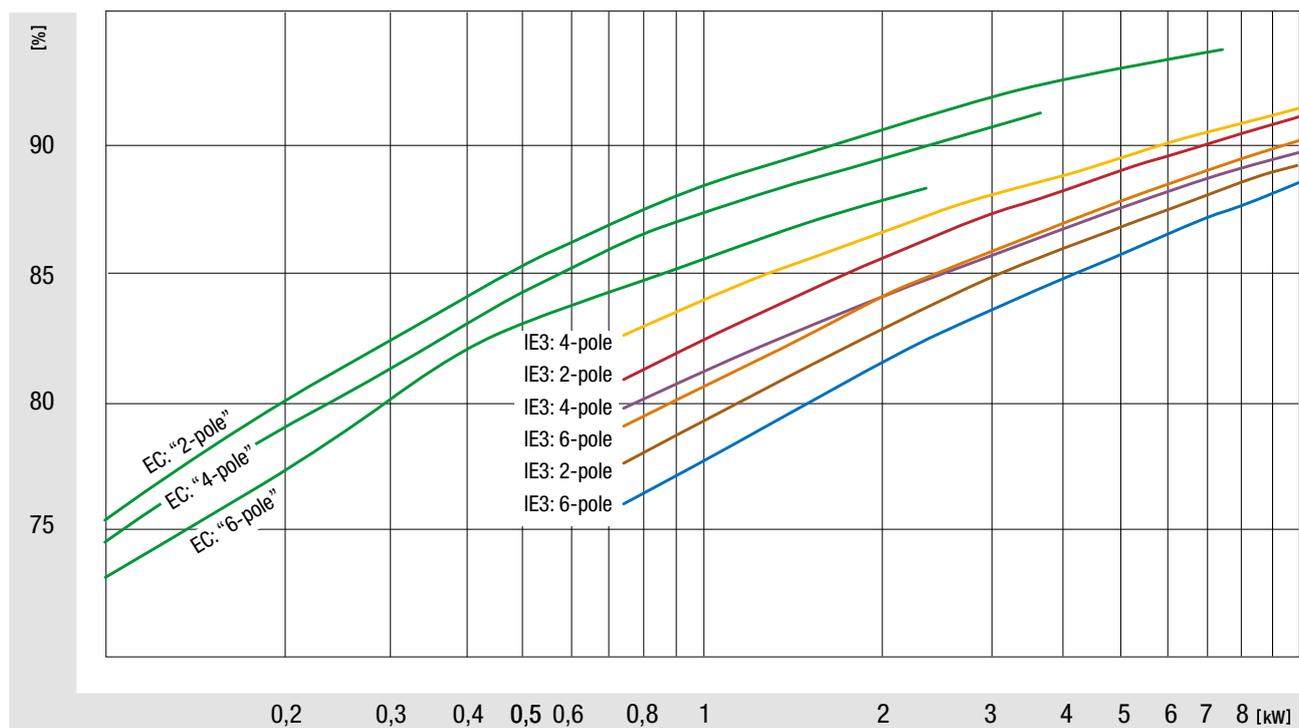
Features	EC motors		AC motors		
	Single-phase motor	Three-phase motor	Shaded-pole motor	Single-phase capacitor motor	Three-phase motor
1-phase AC voltage	Yes	Yes	Yes	Yes	In some cases (Steinmetz circuit)
3-phase AC voltage	No	Yes	No	No	Yes
DC voltage connection	Yes	Yes	No	No	No
Block diagram of stator					
Rotor principle	Magnetic rotor	Magnetic rotor	Squirrel-cage rotor	Squirrel-cage rotor	Squirrel-cage rotor
Efficiency	Very good	Very good	Low	Medium	Good
Integrated infinitely variable speed setting	Yes	Yes	No	No	No
Noise characteristics	Medium	Very good	Medium	Good	Very good

Efficiency levels of EC and AC motors without variable frequency drive

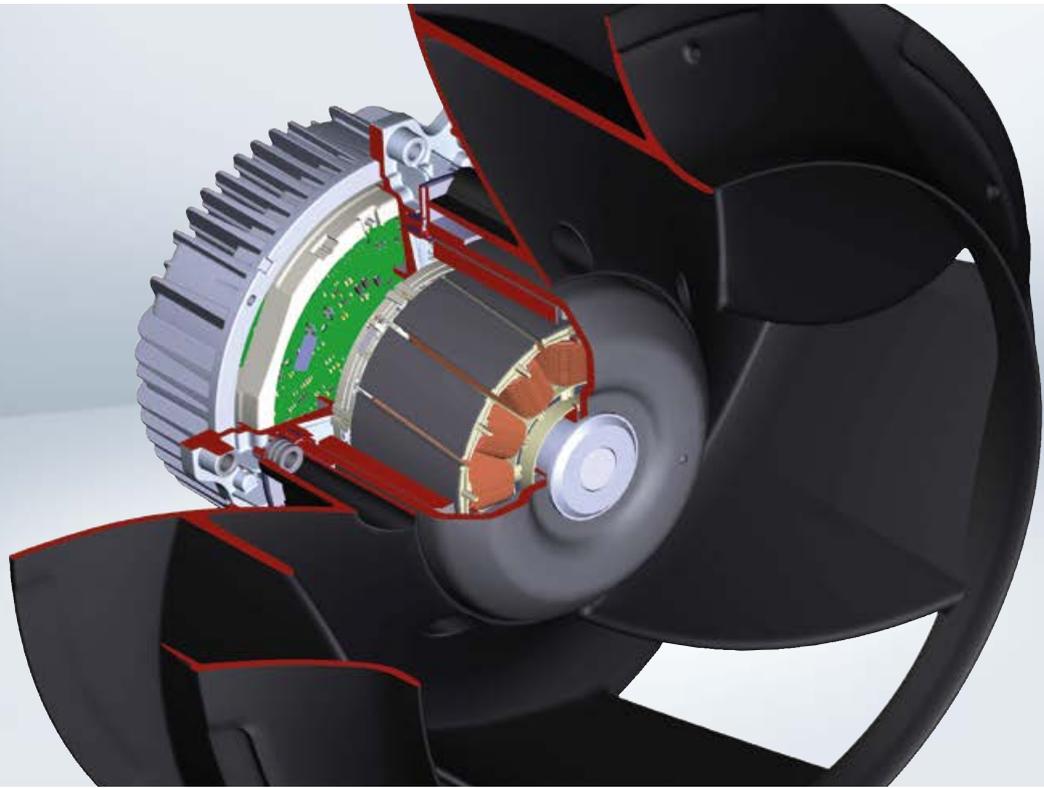
EC external rotor motors, used for example as drive units in energy-efficient fans, are not subject to the ErP implementing regulations no. 2009/640/EC of the European Union.

Their efficiency levels can however be compared to the values demanded by the directive. Such comparison reveals that the EC motors far surpass the efficiency level specified in this.

EC motor technology is thus the better alternative when planning energy-efficient devices and installations.

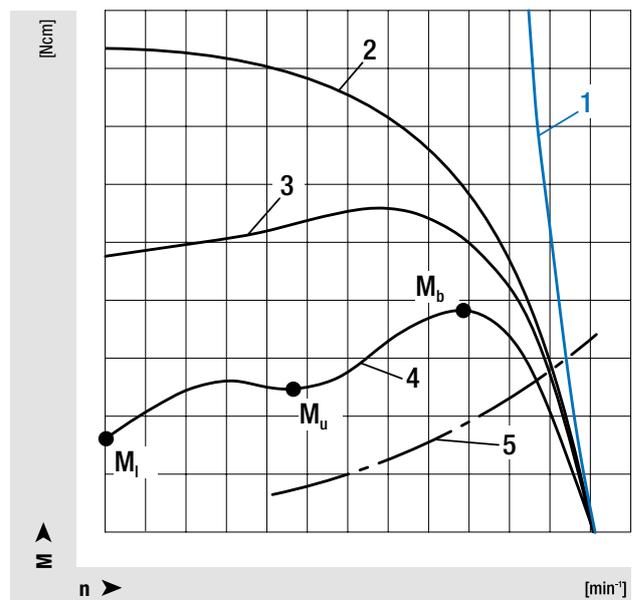


EC motors from ebm-papst



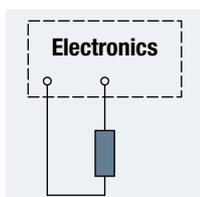
Torque curves of motor types

EC motor operation is based on the principle of synchronous rotation of the stator rotating field and the rotor.



- 1 – EC motor
- 2 – Three-phase motor
- 3 – Single-phase motor
- 4 – Shaded-pole motor
- 5 – System curve
- M_l – Starting torque
- M_u – Saddle torque
- M_b – Breakdown torque

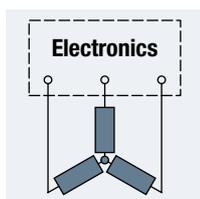
Single-phase motor



Benefits:

- Integrated speed setting
- Efficiency between 50% and 80% (depending on motor size)
- Long service life

Three-phase motor



Benefits:

- Integrated speed setting
- Good efficiency between 60% and 90% (depending on motor size)
- Long service life
- Very good vibration and noise characteristics even in open-loop control operation
- Suitable for use as drive motor



AC motors from ebm-papst

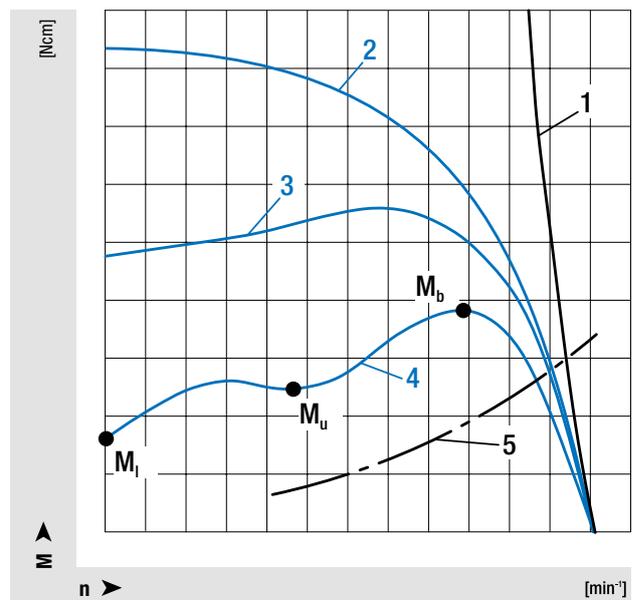


Torque curves of motor types

AC motor (induction motor) operation is based on the principle of asynchronous rotation of the stator rotating field and the rotor.

Starting current

The starting current of AC motors from ebm-papst is a maximum of 4 times higher than the specified nominal current.



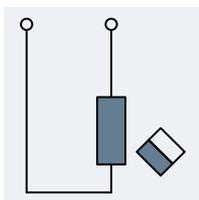
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Shaded-pole motor

Each pole of the motor is electromagnetically split into a main and an auxiliary pole by a shading coil to produce a starting torque.

ebm-papst shaded-pole motors are available in 2-pole or 4-pole symmetrical external or internal rotor design.

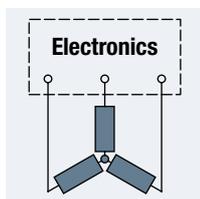


Benefits:

- Extremely robust motor design thanks to a cast squirrel-cage rotor and a stable bearing system
- Low-cost motor
- Extremely simple connection
- Long service life

Single-phase capacitor motor

Two windings (main winding and auxiliary winding) produce the rotating field of a single-phase capacitor motor by way of a capacitor connected in series with the auxiliary winding.



Benefits:

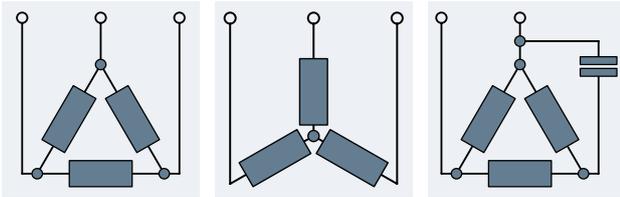
- Extremely robust motor design thanks to a cast squirrel-cage rotor and a stable bearing system
- Numerous speed setting options
- Efficiency between 30% and 75% (depending on motor size)
- Long service life
- Good vibration and noise characteristics



AC motors from ebm-papst

Three-phase motor torque curves

The three motor phases, differing by 120 electrical degrees, produce a circularly rotating field on connection to a three-phase supply.



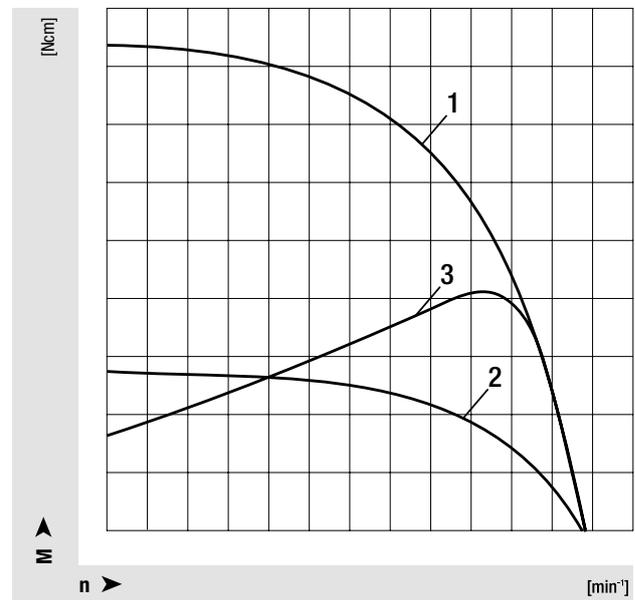
Delta connection

Star connection

Steinmetz circuit

Benefits:

- Extremely robust motor design thanks to a cast squirrel-cage rotor and a stable bearing system
- Very good vibration and noise characteristics
- Efficiency between 40% and 80% (depending on motor size)
- Extremely long service life



- 1 – Delta
- 2 – Star
- 4 – Steinmetz circuit

We hope that this brochure was able to provide you with an in-depth insight into our technologies, our product applications and important basic principles. Please do not hesitate to contact us should you have any further questions on specific applications. Our specialists will be delighted to help.

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