



## Motors made by ebm-papst

In AC and EC technology, ebm-papst relies on the proven external-rotor motor principle, with the rotor turning around the stator within. Advantages of the ebm-papst external-rotor principle are:

- Space saving design due to integrated bearings and direct installation inside the impeller
- lower load and more precise balancing of the bearing due to the fixed connection of all rotating elements
- Prolonged service life due to the motor-impeller unit placed right within the air flow

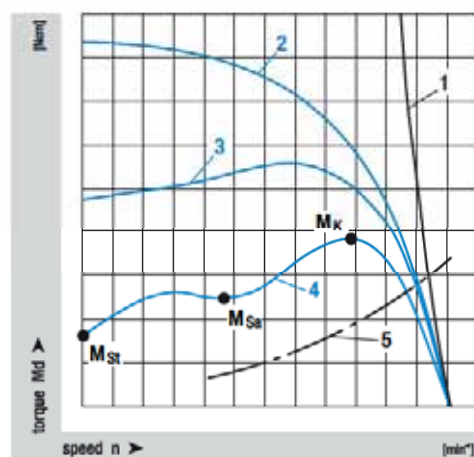
The ebm-papst motors achieve very good results in efficiency and acoustic behaviour when used in EC technology.

Features	AC motors			EC motors	
	Shaded-pole motor	Single-phase capacitor motor	3-phase motor	Single-core motor	3-core motor
1~ AC voltage connector	Yes	Yes	Limited use (Steinmetz circuit)	Yes	Yes
3~ AC voltage connector	No	No	Yes	No	Yes
DC voltage connector	No	No	No	Yes	Yes
Design of circuit diagram - Stator -			 	<div>Electronics (see p. 598)</div>	<div>Electronics (see p. 598)</div>
Rotor principle	Squirrel cage	Squirrel cage	Squirrel cage	Magnetic rotor	Magnetic rotor
Efficiency	Low	Medium	Good	Excellent	Excellent
Continuous speed setting integrated	No	No	No	Yes	Yes
Noise behaviour	Medium	Good	Excellent	Medium	Excellent

## AC motors

- AC motors (induction motors) are based in their function on the principle of the asynchronous rotation of the stator rotating field and rotor.

### Torque curves of the motor types



#### Key:

- |                        |                                   |
|------------------------|-----------------------------------|
| 1 – EC motor           | 5 – System characteristic         |
| 2 – 3-phase motor      | M <sub>St</sub> – Starting torque |
| 3 – Single-phase motor | M <sub>St</sub> – Saddle torque   |
| 4 – Shaded-pole motor  | M <sub>K</sub> – Breakdown torque |

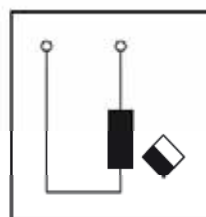
### Start-up current

The start-up current of our AC motors is maximally 4x higher than the nominal current given.

### Shaded-pole motor

Each pole of the motor is divided electro-magnetically into a main and auxiliary pole (split) via a cage winding in order to generate a starting torque.

At ebm-papst, shaded-pole motors are available as 2 or 4-pole symmetrical external or internal rotor designs.

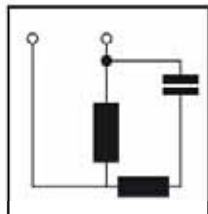


#### Advantages:

- Extremely robust motor design due to cast squirrel cage rotor and stable bearing system
- Cost-efficient motor
- Extremely easy to connect
- Long service life

### Single-phase capacitor motor

Two cores (main winding MW and auxiliary winding AW) generate the rotating field of the single-phase capacitor motor via a capacitor connected in series to form an auxiliary winding.

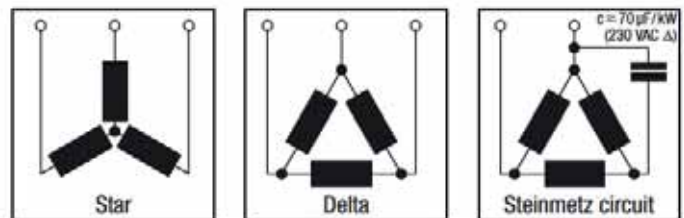


#### Advantages:

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

### 3-phase motor

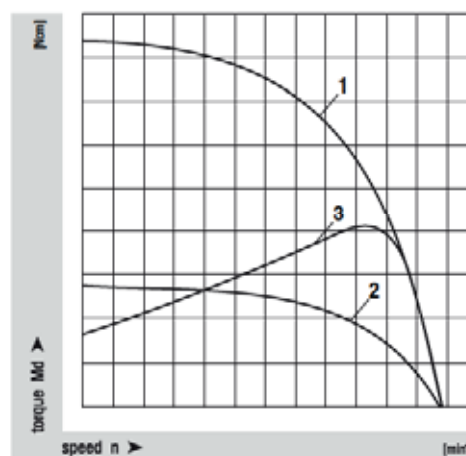
The three motor cores are offset by 120° and generate a circular rotating field when connected to the 3-phase mains.



#### Advantages:

- Extremely robust motor design due to cast squirrel cage rotor and stable bearing system
- Very good vibration and noise behaviour
- Efficiency between 40 % and 80 % (depending on the motor size)
- Long service life

### Torque curves of 3-phase motors



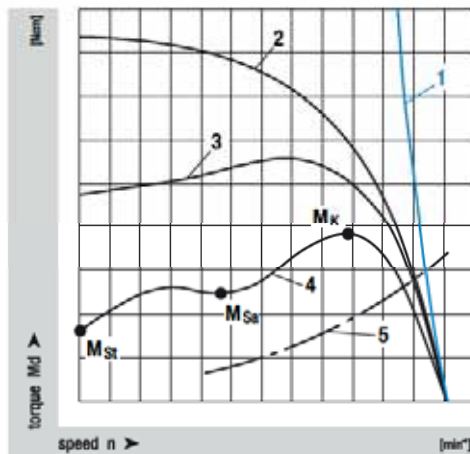
#### Key:

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

## EC motors

- EC motors are based in their function on the principle of the synchronous rotation of stator rotating field and rotor.

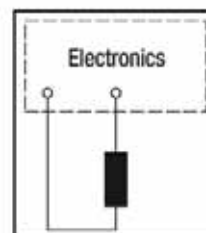
### Torque curves of the motor types



#### Key:

- |                        |                            |
|------------------------|----------------------------|
| 1 – EC motor           | 5 – System characteristic  |
| 2 – 3-phase motor      | $M_{St}$ – Starting torque |
| 3 – Single-phase motor | $M_{Sa}$ – Saddle torque   |
| 4 – Shaded-pole motor  | $M_K$ – Breakdown torque   |

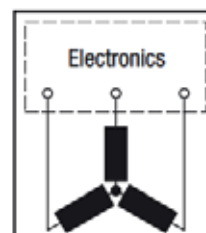
### Single-core motor



#### Advantages:

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

### 3-core motor



#### Advantages:

- Integrated speed setting
- Good efficiency between 60 % and 90 % (depending on the motor size)
- Long service life
- Very good vibration and noise behaviour even in controlled operation
- Can be used as drive motor