

## AIRAH - EC-fans and speed control

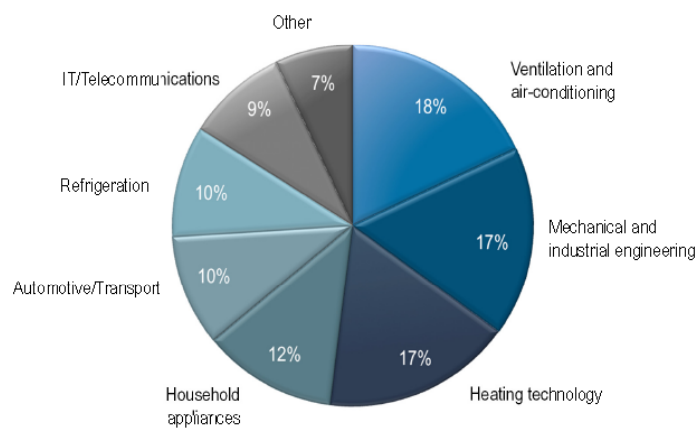
Thomas Heine – 06/09/2011



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## ebm-papst group overview

Global industry structure



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## ebm-papst group overview

Green Tech – a symbol that defines standards



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## ebm-papst group overview

ebm-papst A&NZ – teams, individuals, families



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## EC-Technology

### What is an EC-motor?

#### *What is an EC- motor?*

It is a  
brushless, permanent magnet, synchronous motor  
with electronically commutation...

*...but we just name it*

**E**LECTRONICALLY  
**C**OMMUTATED motor or

**EC** motor



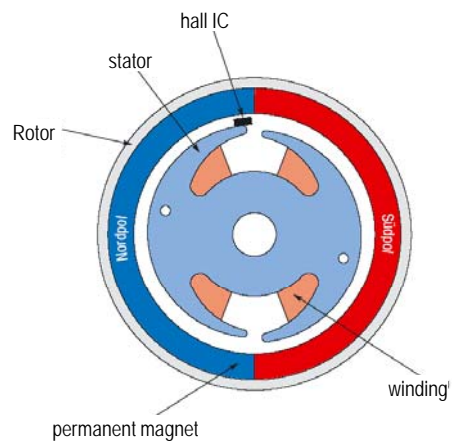
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## EC-Technology

### What is an EC-motor?

Basic principle of EC technique

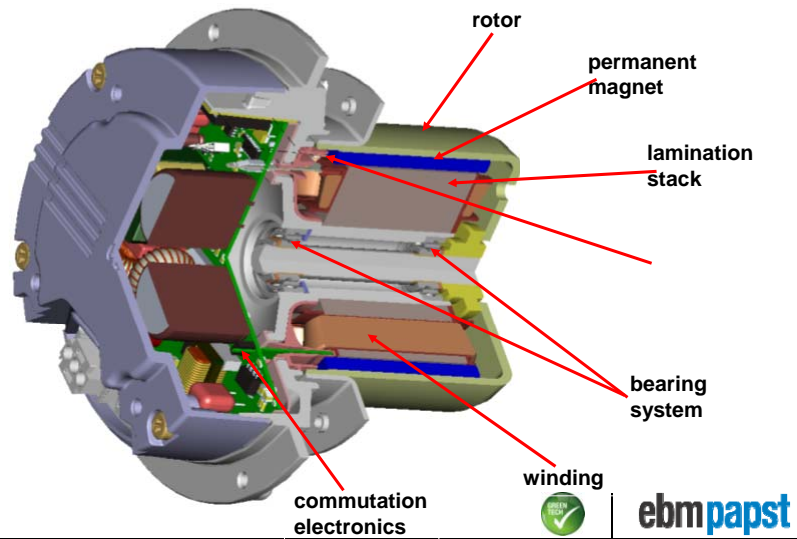
- permanent magnets produce magnetic field inside the rotor
- commutating occurs electronically and therefore wear-free
- mains supply for EC-motor is DC or AC depending on motor type



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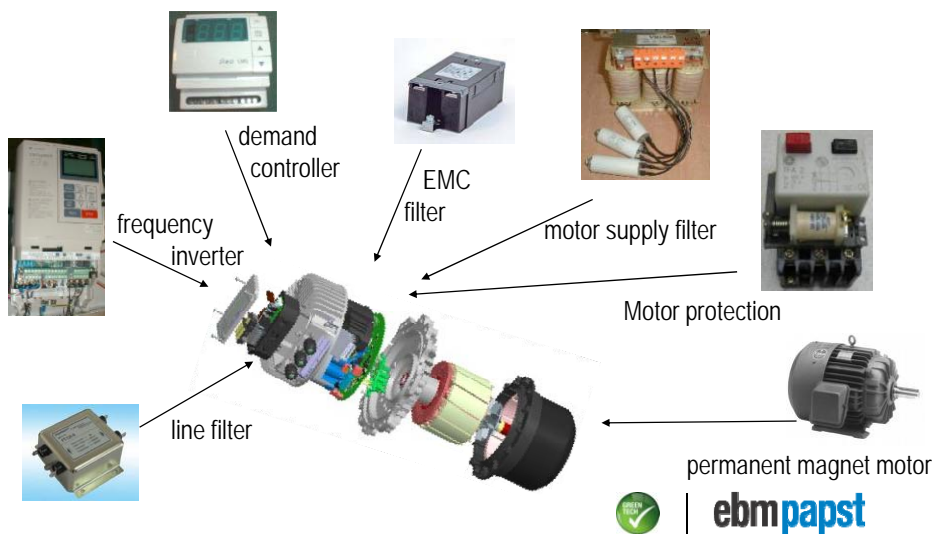
## EC-Technology

What is an EC-motor?



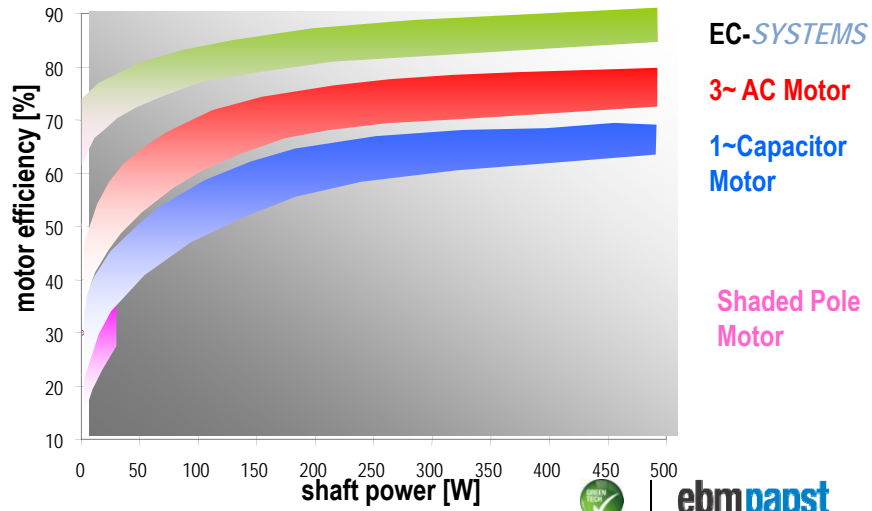
## EC-Technology

Features of an EC-motor



## EC-Technology

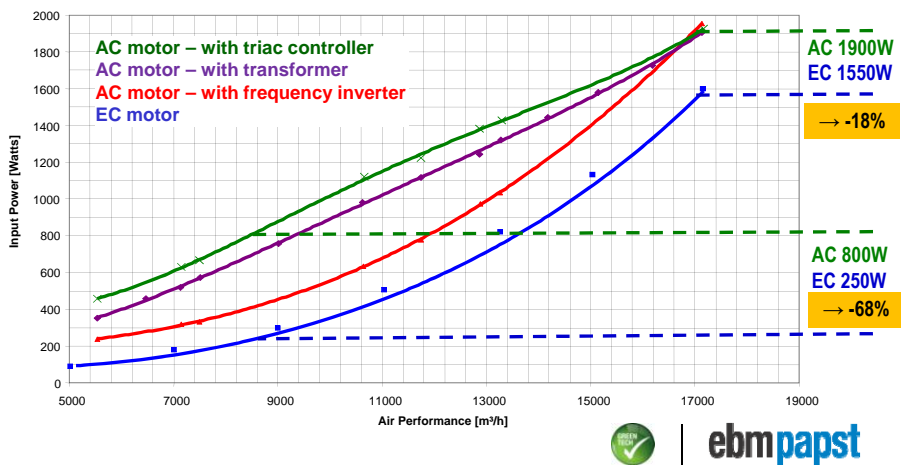
EC motor – premium efficiency



## EC-Technology

EC motor – premium efficiency

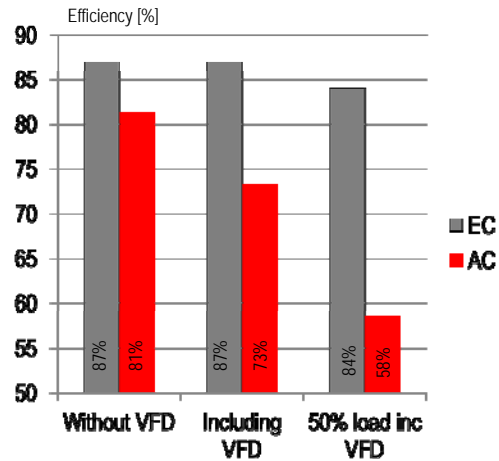
Control systems comparison - fan size: 800mm axial



## EC-Technology

### EC motor – premium efficiency

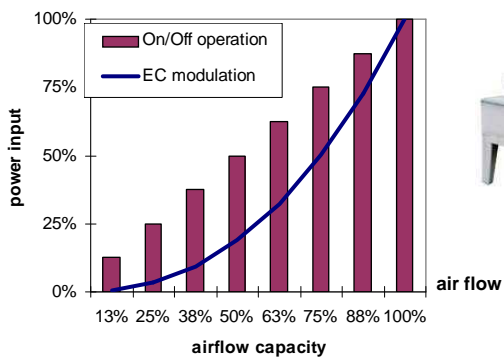
- Comparison of induction motor
  - > 1.5 kW MEPS 6 pole motor with VSD  
=> 73% efficient
- EC motor with integrated VSD
  - > 87% efficient
  - > 300 W saving
- High pole motors are more dramatic
  - > 1.1 kW induction motor 8 pole  
=> 63% efficient
  - > 1.1 kW AC with VSD  
=> 57% efficient
  - > EC with integrated VSD  
=> 84% efficient



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## EC-Technology

### EC motor – premium efficiency



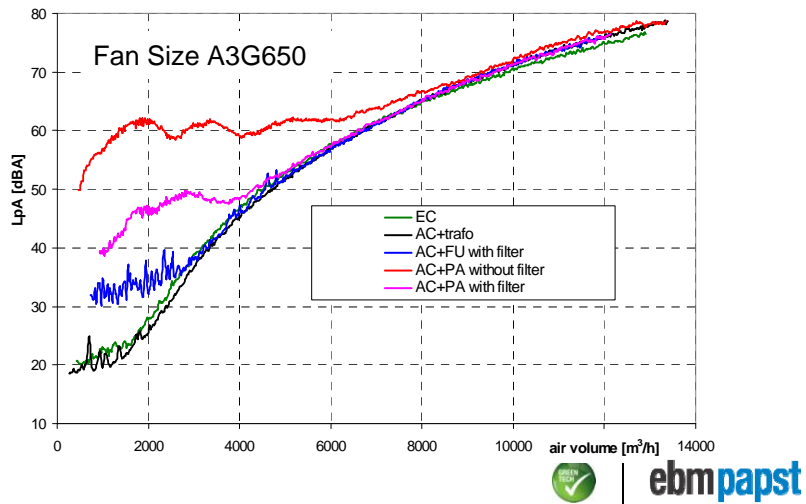
Fan laws:  $P_1 \sim n^3$



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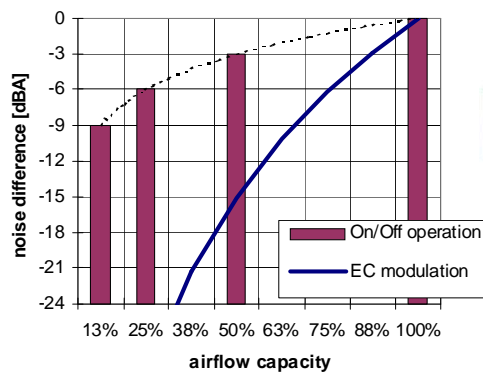
## EC-Technology

EC motor – lower noise level at reduced speed



## EC-Technology

EC motor – lower noise level at reduced speed



Fan laws:  $\Delta L_p [dB] = 50 \times \log_{10} (n_1/n_2)$



## EC-Technology

EC motor – the only motor that follows fan laws

Fan law / Formula    ~ fan speed    ~ (fan speed)<sup>3</sup>    50\*log<sub>10</sub>(n<sub>1</sub>/n<sub>2</sub>)

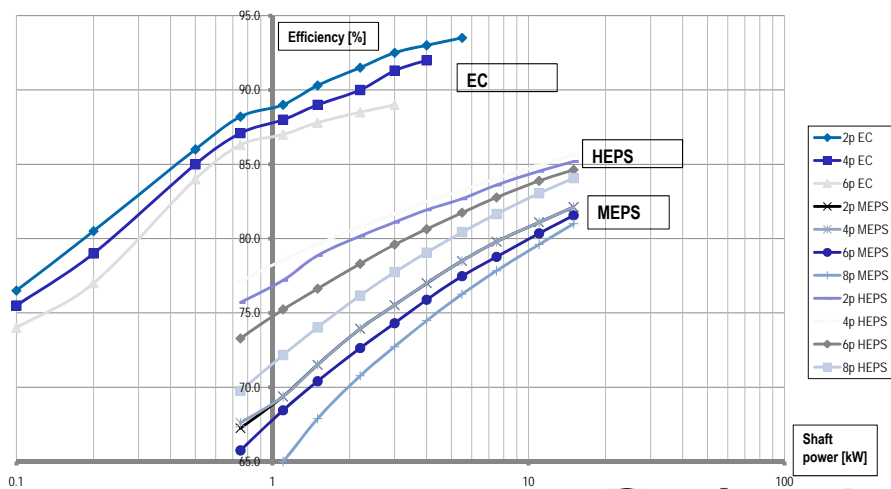
Fan Speed	Air Volume	Power	noise / sound dB
100%	100%	100%	0.0
95%	95%	86%	-1.1
90%	90%	73%	-2.3
75%	75%	42%	-6.2
50%	50%	13%	-15
25%	25%	1,6%	-30



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## EC-Technology

Future proof technology



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## EC-Technology

The right solution for HVAC-R applications



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## EC-Technology

The right solution for HVAC-R applications



0-10V

4-20mA

Different applications have different signals:

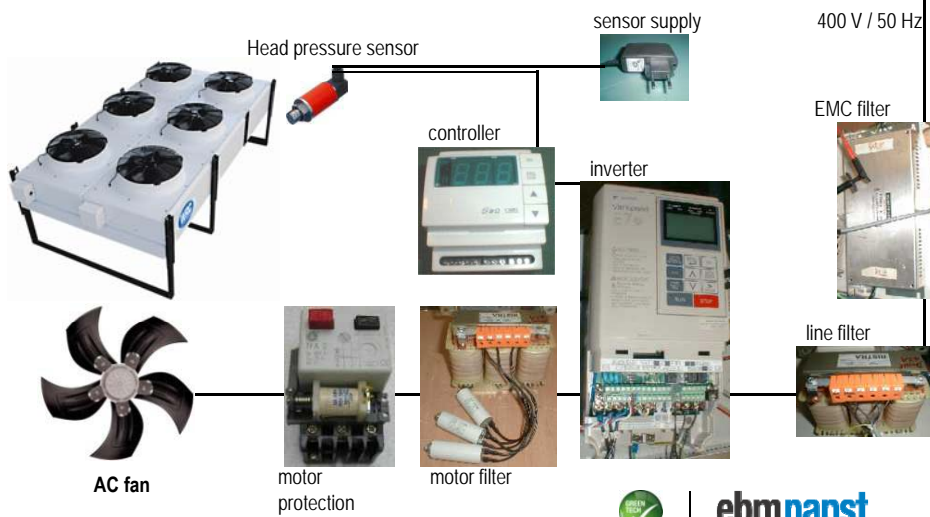
- Temperature sensors
  - Head pressure sensors
  - Pressure sensors
  - SPCs
  - ..
- nearly everything is possible!



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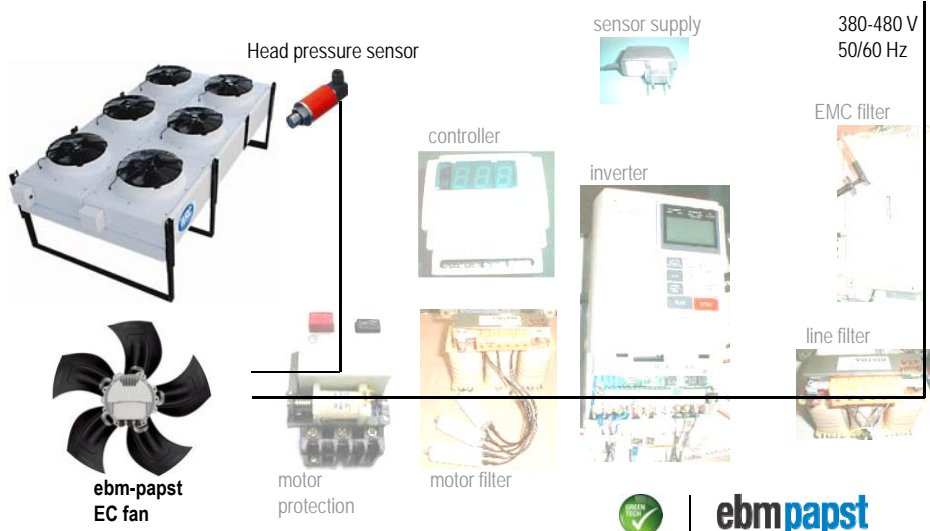
## EC-Technology

Simple speed control compared to VSD



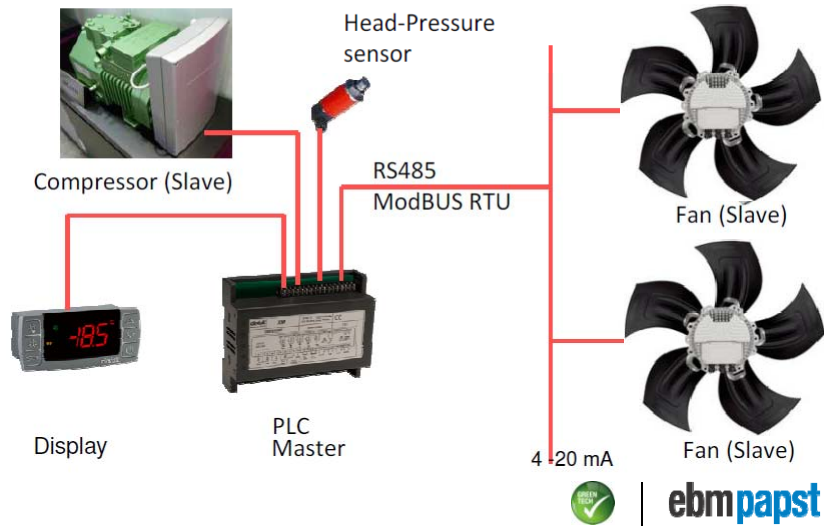
## EC-Technology

Simple speed control compared to VSD



## EC-Technology

### Speed control with Modbus RTU



## Application: Refrigeration

What type of speed control do you need?



## Application: Refrigeration

What type of speed control do you need?



### iQ<sup>2</sup>

- Drop-in replacement for Q-motors
- New generation with 2 speeds



### W1G-range

- 2 programmable speeds



### S3G300 / 350

- 2 speed or 0-10V control input



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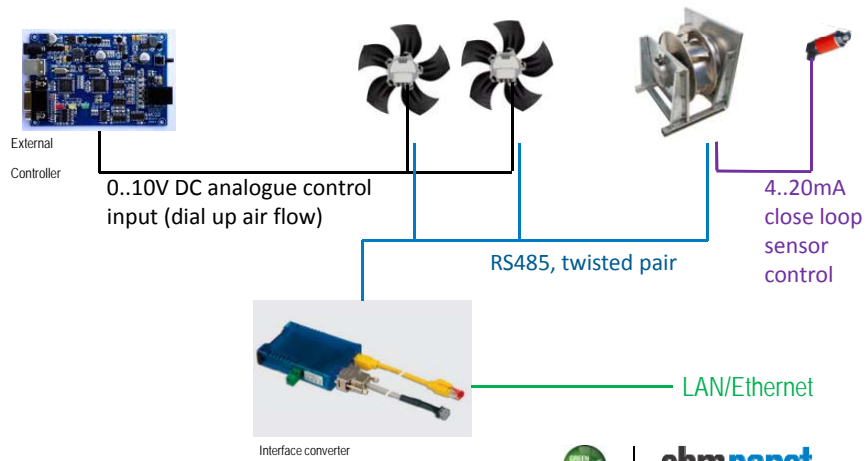
Do you have any questions?



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## EC-Technology

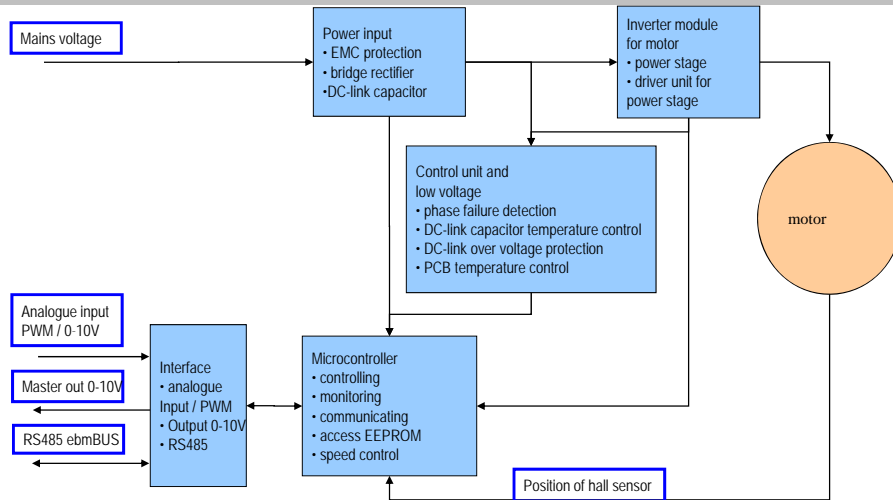
### Speed control options



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## EC-Technology

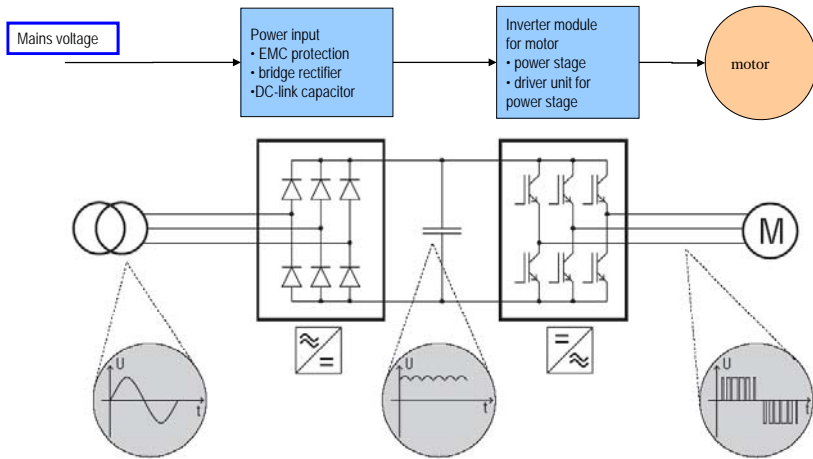
### What is an EC-motor?



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## EC-Technology

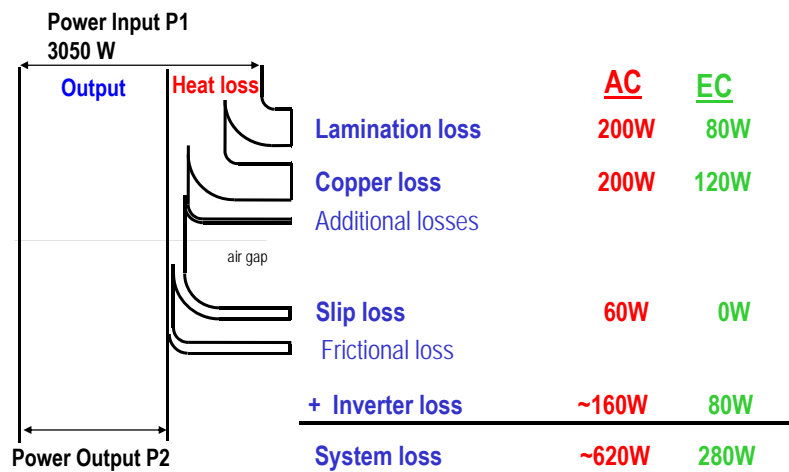
What is an EC-motor?



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## EC-Technology

EC motor – premium efficiency

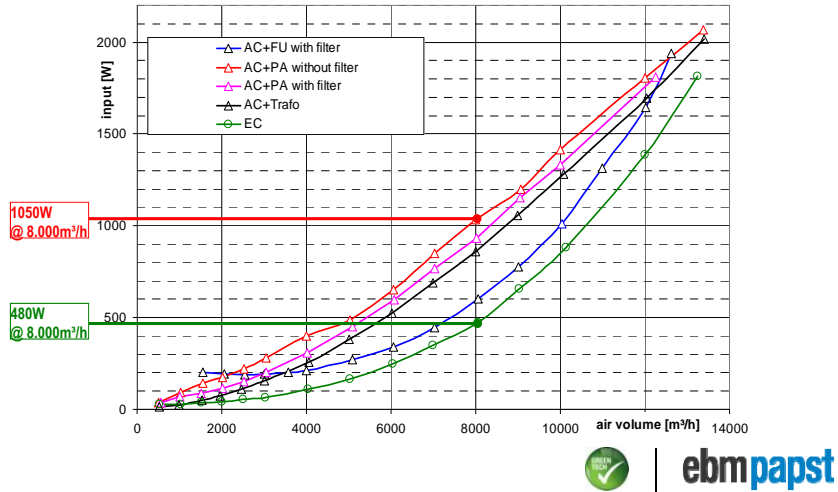


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## EC-Technology

EC motor – premium efficiency

Impeller diameter: 650mm



## EC-Technology

EC motor – premium efficiency

