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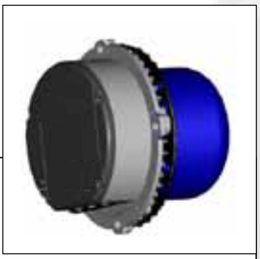
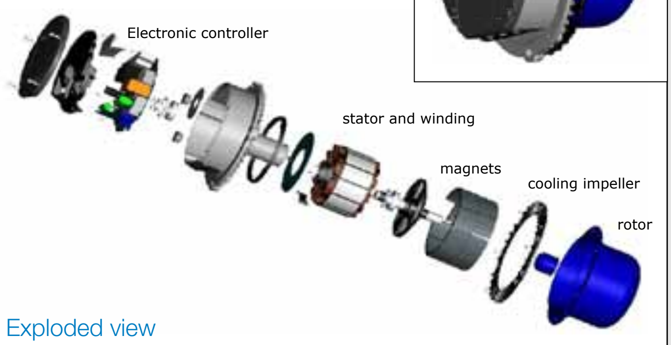
EC vs AC. The facts.

External Rotor EC Motor

EC Motor Mechanical Configuration

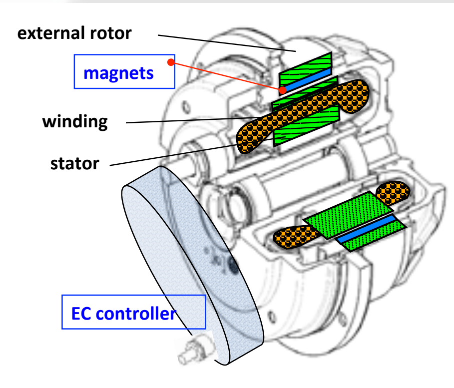




Exploded view

Main component orientation:-

✓ Motor rotor positioned outside the stator



EC Motors (electronically commutated)

✓ Commutation is required in both brushed and brushless DC motors.

✓ Mechanical commutation is performed by the brushes and commutator of brushed motors.

✓ In the case of brushless DC motors, the commutation is achieved electronically, hence the term Electronic Commutation.

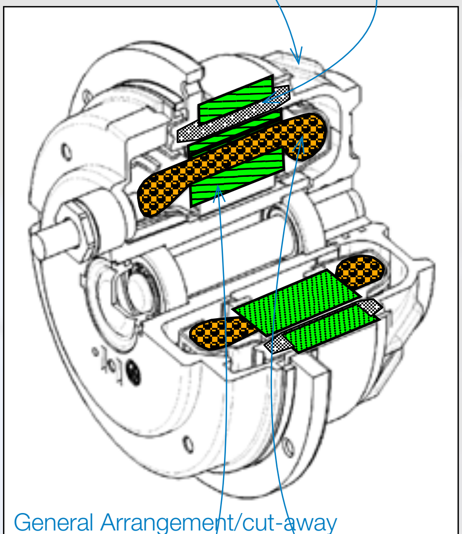
✓ In permanent magnet external rotor EC motors, the stator which has the power applied to it sits within the rotor.

✓ A rotating magnetic field is created in the stator winding by means of Electronic Commutation.

✓ The permanent magnets inside the rotor are drawn around by the rotating stator magnetic field, causing the rotor to rotate.

External Rotor AC Motor

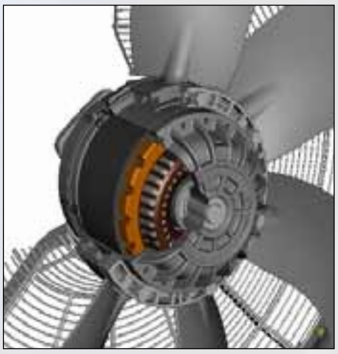
AC Motor Mechanical Configuration



General Arrangement/cut-away

Main component orientation:-

✓ Motor rotor positioned outside the stator.



Fan Application

✓ Fan impeller either integral with the rotor, or bolted to the rotor.

✓ Very compact design, when compared with internal rotor motor.

Source: Ziehl-Abegg

For help, advise or more information, please contact Elta Fans on:
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EC vs AC. Continued...

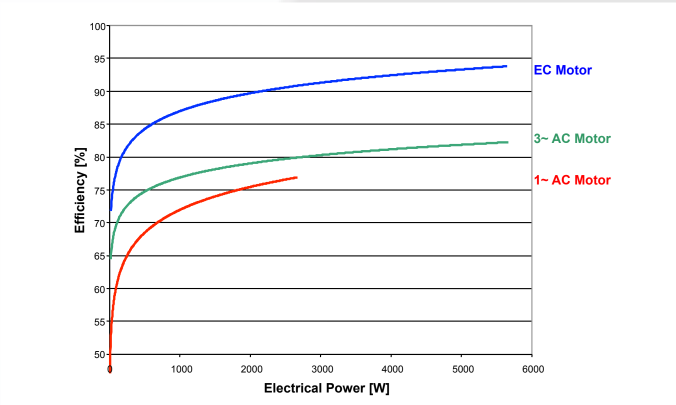
EC Motor Losses

Stator copper losses → Current flowing through stator windings creates heat.
Rotor copper losses → None.
Rotor slip losses → None.
Iron core losses → Hysteresis and eddy currents in the stator laminations only, creating heat.
Electronic losses → Low level losses from using electricity to drive electronics.
Other losses → Bearing friction, windage...

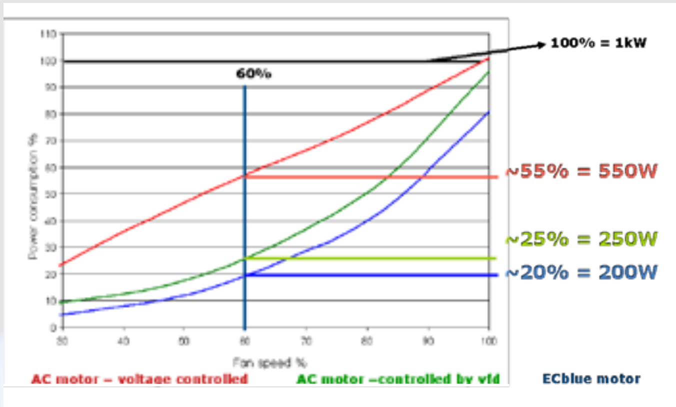
AC Motor Losses

Stator copper losses → Current flowing through stator windings creates heat.
Rotor copper losses → Current flowing through rotor conductors creates heat.
Rotor slip losses → Increasing slip increases the current flowing through rotor conductors, creating more heat, especially at reduced speed.
Iron core losses → Hysteresis and eddy currents in the stator and rotor laminations, creating heat.
Electronic losses → N/A
Other losses → Bearing friction, windage...

Comparative Motor Efficiencies



EC Fans vs AC Fans



EC or AC driven fans?

- ✓ Relatively high capital expenditure, but reducing.
- ✓ Using permanent magnets means none of the electricity applied tto the stator is required to induce magnetic fields in the rotor- (higher efficiency).
- ✓ Speed control built into the electronic commutation electronics.
- ✓ Relatively low losses compared with equivalent AC motors, especially at reduced speed.
- ✓ Higher efficiency than equivalent AC motor, especially at reduced speed, so lower running costs and ‘life-time costs’.

EC or AC driven fans?

- ✓ Relatively low capital expenditure.
- ✓ Some electrical power is required to ‘induce’ magnetic fields in rotor laminations and induce current flow in rotor conductors- (lowered efficiency).
- ✓ Additional items required for speed control-additional cost for speed control.
- ✓ Relatively high losses (slip, core), compared with EC motors, especially at reduced speed - (lowered efficiency at reduced speed).
- ✓ Relatively high running costs and so relatively high ‘life-time costs’.

SUMMARY

- ✓ Relatively high capital expenditure, but reducing.
- ✓ Higher efficiency than equivalent AC fan, especially at reduced speeds.
- ✓ Speed control built into the electronic commutation electronics.
- ✓ Higher efficiency than equivalent AC fan, especially at reduced speeds, so lower running costs and ‘life-time costs’.

SUMMARY

- ✓ Relatively low capital expenditure.
- ✓ Lower efficiency than equivalent EC fan, especially at reduced speeds.
- ✓ Additional items required for speed control.
- ✓ Relatively high running costs compared with equivalent EC fan, and so higher ‘life-time costs’.

Source: Ziehl-Abegg

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