

Catalog EC FAN REV.1 July 2018

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INFINAIR® 英飞



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INFINAIR® 英飞

英飞EC风机简介

INFINAIR EC FAN INTRODUCTION



英飞“易合”智能风机为您创造的价值
VALUE OF THE INFINAIR TRINITY-LEAN SMART FAN FOR YOU

η_{Motor} 英飞EC电机技术 INFINAIR EC Motor Technology

英飞符合欧盟IE4标准的高效电机：

- A. 精湛的直流无刷电机制造工艺：细节严谨，可靠稳定，寿命长久
 - B. 永磁体励磁：避免了励磁损耗与转子损耗
 - C. 外转子电机：体积紧凑，布局灵活
 - D. FEA有限元分析控制结构的可靠性和寿命
- 整体效果：大幅提升效率等级，远高于同功率AC电机。**

The Highly Efficient INFINAIR EC Motor Conforming to IE4 Standard:

- A. Exquisite Brushless Direct Current (BLDC) Motor Manufacturing Technology: Featuring detail-oriented design, reliable quality and long service life
- B. Permanent Magnet Technology: Free from loss of excitation and rotor loss
- C. External Rotor Motor: Compact design and flexible locations
- D. Reliability and service life controlled by FEA method

Overall Performance: A lot more efficient than the AC motor of the same power



η_{Impeller} 英飞独特的仿生空气动力学技术 Unique INFINAIR Bionic Aerodynamics Technology

英飞专业气动性能研究

英飞节能仿生：鹦鹉螺为什么可以轻松浮动和游走？鸟类是如何以极低的能耗滑翔千里？

英飞降噪仿生：猫头鹰的静音飞行，为什么敏锐的老鼠也毫无察觉？

流场模拟分析技术：结合仿生技术研究的结果，模拟计算叶轮的气动模型（叶片数，角度，宽度和曲面）的结果，指导优化。

有限元分析技术：针对受力和材料特性进行结构可靠性分析。

关注整体而非局部：叶轮，外转子电机，格栅，进风口，综合系统优化。

INFINAIR Aerodynamic Research

Bionic Energy Conservation: How can nautilus swim around underwater quite easily? How can birds fly thousands of miles with extremely low energy consumption?

Bionic Sound Reduction: How can owls fly so silently even oblivious to the sound-sensitive mice?

CFD Simulation and Analysis: To simulate and figure out the aerodynamic impeller model (number of blades, blade angles, width, and curved surface) based on the bionic research outcomes.

FEA Technology: To analyze and provide an accurate prediction of how a material, component or structure is likely to respond when subjected to structural and/or thermal loads.

Focus on the whole: Comprehensive system optimization covering impeller, external rotor motor, grill and inlet.



η_{Controller} 英飞智能风机控制技术 INFINAIR Smart Control Technology

- A. 英飞第三代智能电子换向算法：反复迭代、精益求精
- B. 无需位置传感器，使用更可靠
- C. 正弦波调节原理，无级变速，平滑稳定
- D. 保护功能强大——软、硬件的双重保护策略
- E. 标准工业通讯接口、控制信号灵活选择
- F. 工业物联网，远程监控：防患未然

A. The 3rd Generation INFINAIR Electronic Commutation Algorithm: Continuously iterated for constant improvement

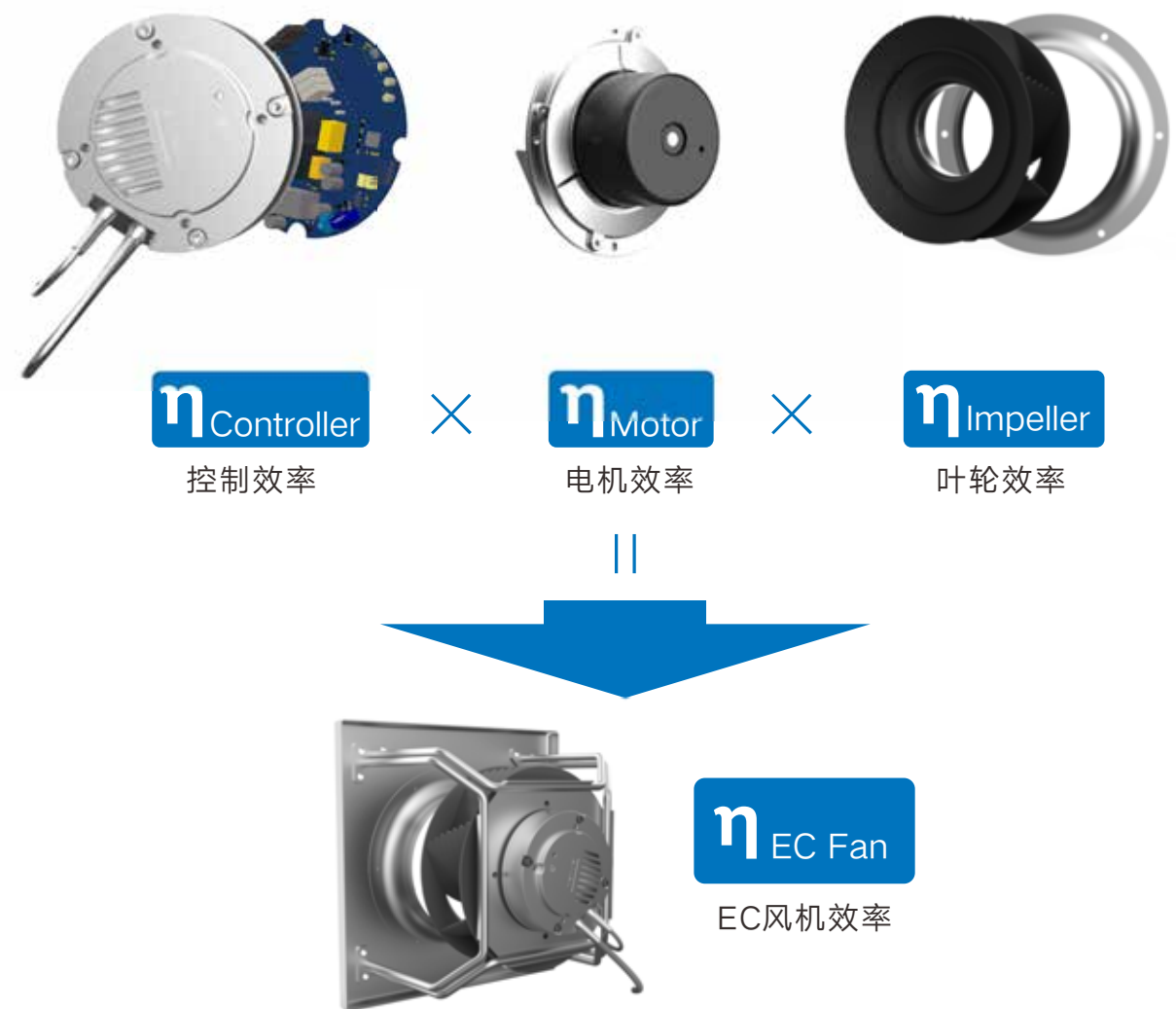
B. Greater reliability without position sensors

C. Stepless variable speed and stability ensured by way of sine wave control

D. Powerful Protections: Dual protections with both software and hardware

E. Standard industrial communication interface and flexible signal types

F. Industrial Internet of Things allowing remote monitoring for possible faults





驱动控制系统 Drive Control System

控制多样 Various Control Methods

恒转速、恒功率等多种控制方式
Various control methods such as constant speed control and constant power control

连续可调的速度控制
Continuously variable speed control

控制信号标配0-10V DC和PWM兼容
0-10V DC control signal compatible with PWM

可选MODBUS RTU等
The MODBUS RTU protocol available

调试简单 Easy Commissioning

电机与控制系统一体化，无需调整
Integrated motor and control system requiring no adjustments

用途广泛 Wide Range of Applications

可使用交流/直流电源输入
AC/DC power supply available

可兼容50/60Hz交流电源
50/60Hz AC power supply compatible

宽电压范围，可在世界各地使用
Wide voltage range for international usage

运行可靠 Reliable Operation

FOC正弦波控制，可靠且噪音低
FOC sine wave control for great reliability and low sound

过欠压、过流、过温等多种软硬件双重保护
Dual protections of overvoltage, undervoltage, overcurrent and over-temperature through both software and hardware

速度反馈和警报输出
Speed and alarm output options available

EC电机 EC Motor

寿命长 Long Service Life

免维护轴承
Maintenance-free bearings

无刷换向
Brushless commutation

运行可靠 Reliable Operation

绝缘轴承，避免产生电流
Current-insulated bearings

无感换向、S1运行（连续运行）
Sensorless commutation and duty type S1 (continuous operation)

无电刷磨损,无电磁干扰,无火花
No brush wear, electromagnetic interference or spark produced

效率高 Great Efficiency

永磁磁体，无转子损耗，无励磁损耗
Permanent magnet without rotor loss and loss of excitation

分数槽集中绕组，铜损小
Fractional slot concentrated windings with little copper

运行经济 Economical Operation

电子换向，运行可靠
Electronic commutation for reliable operation

不同负载运行，仍可保持高效率
High efficiency maintained under different load conditions

无级调速不需其他硬件
Stepless variable speed requiring no additional control

噪音低 Low Sound

FOC正弦波控制
FOC sine wave control

优化槽极配合，分数槽集中绕组，降低转矩脉动
Optimized pole-slot match and fractional slot concentrated windings to reduce torque ripple

高性能叶轮 High Performance Impeller

效率高 Great Efficiency

经CFD流场模拟优化的空气流动
Air passages optimized by CFD flow field simulation

最佳匹配的进口文丘里管曲线
Curved inlet bell perfectly matched to the impeller

振动小 Low Vibration

经整体动平衡校正的叶轮、电机转子组件
Impeller and motor rotor dynamically balanced

经专利授权的动平衡校正方案，确保长期运行可靠不失效
Patented dynamic balancing scheme to ensure operational durability and reliability

动平衡等级高达G2.5
Dynamic balance quality grade G2.5

噪音排放低 Low Sound

优化叶片噪音
Blades optimized with respect to sound level

振动小，噪音低
Low vibration and sound

设计与生产 Design and Production

复合材料、镀锌、铝合金等多种叶轮配置
Different impeller materials available, including composite materials, galvanized steel and aluminum alloys

三元流叶片、机翼型叶片等满足各类工况
Three-dimensional blades, airfoil blades and other forms of blades meeting various operating conditions

模具成型、专用工装定位、连续焊接
Die-forming, dedicated tooling and continuous welding

结构紧凑 Compact Design

叶轮安装于电机外转子上
Impeller mounted on the external motor rotor

进风口文丘里管 Inlet Bell

选配 Optional Accessories

可选优化设计的进口文丘里管
Inlet bell of optimized design

可选压力计接口实时监测气体流量
Pressure tap for airflow monitor in real time

损耗低 Low Loss

优化的叶轮进气条件
Impeller design allowing optimized airflow

流线型进口文丘里管减少紊流
Streamlined inlet bell reducing turbulences

支架结构 Mounting Bracket System

易于安装 Easy Installation

全套系统，安装快捷简单
Suitable bracket offered for easy installation

结构紧凑，适应度高
Compact design and high adaptability

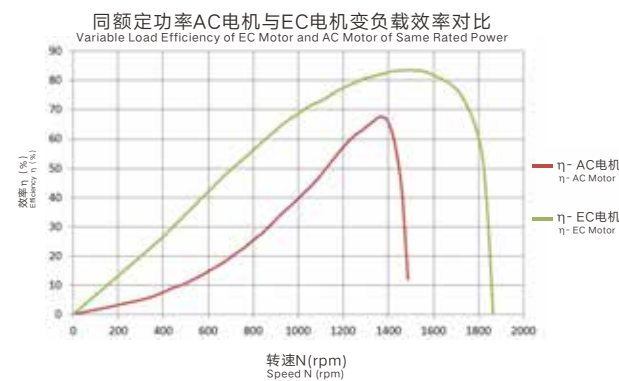
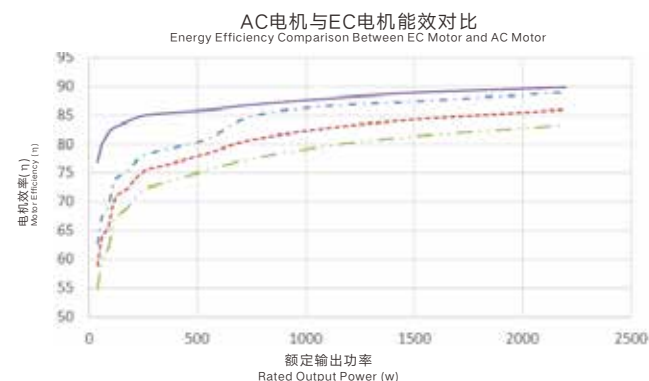
更优空气动力学性能 Optimum Aerodynamic Performance

已定位至最佳文丘里管装配间隙
Positioned in the optimum clearance between impeller and inlet bell

保证最优装配重叠度
Optimum overlap between impeller and inlet bell ensured

英飞EC电机与AC电机的比较

Comparisons Between EC Motor and AC Motor



永磁同步电机与交流电机相比，在同转速、不同负载条件下，效率额定值都高于交流电机各能效等级限制。

The permanent-magnet synchronous motor is more energy efficient than the AC motor of all energy efficiency grades at the same speed and different loads.

- 1级能效-AC三相2级电机
Energy Efficiency Grade 1-2 pole 3-phase AC Motor
- 2级能效-AC三相2级电机
Energy Efficiency Grade 2-2 pole 3-phase AC Motor
- 3级能效-AC三相2级电机
Energy Efficiency Grade 3-2 pole 3-phase AC Motor
- 效率-EC电机3000rpm
Efficiency-EC Motor 3000rpm

EC与AC能效对比：平均节能30%

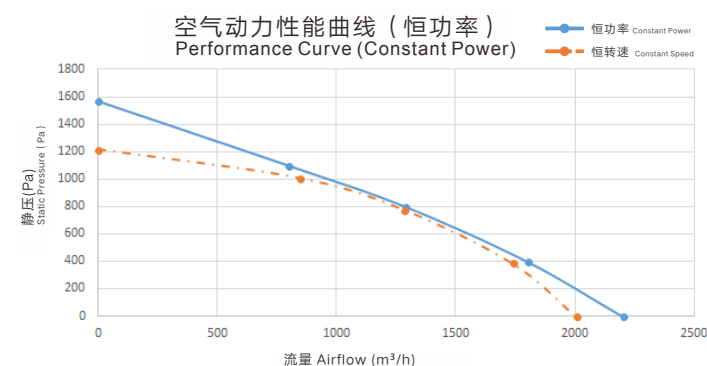
The EC motor is 30 percent more efficient than AC motor on average

即使改变风速和负载，EC风机仍旧可以保持高效运转。由于EC风机的无级变速特点，EC风机可以仅凭借外部控制信号在任意转速下运行，相较于AC风机效率有着明显的优势。在不同断调控范围之内，直接和间接的节能效果都有着显著的提高。如果还考虑AC风机变速运行带来的额外硬件成本和运行损耗，例如变频器等，EC风机的高效优势将更加显著。

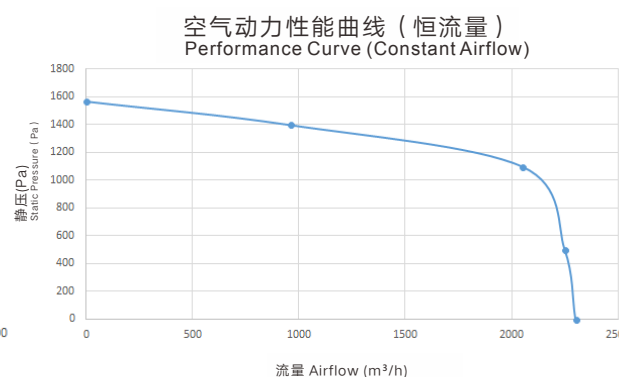
The EC motor can still run in a highly efficient manner as the velocity or load changes. Thanks to the stepless variable speed, the EC motor can run at any speed by virtue of the external control signal. Typically, the EC fan is directly and indirectly more efficient than AC fan. Besides, when the AC fan is changing speeds, it will require additional hardware to support (such as the variable frequency drive) and cause efficiency losses. In this context, the EC fan is a lot more efficient.

英飞EC风机控制方案

INFINAIR EC Fan Control Scheme



恒功率控制：
EC风机可选恒功率控制，使得风机可以在不超额定功率的前提下，调整风机转速，提供最优的空气动力性能。
Constant Power Control:
The Constant power control option is available for the EC motor so that the fan speed can be adjustable within the rated power for optimum aerodynamic performance.



恒流量控制：
EC风机可选恒流量控制，使得风机可以检测空气流量参数，在系统阻力发生变化时，调整风机转速，根据客户要求提供恒定流量。
Constant Airflow Control:
The Constant airflow control option is available for the EC motor so that the airflow parameter can be monitored and fan speed adjusted for the customized airflow as the system resistance changes.

试验验证能力

Testing Capability



风室: Air Chambers:

英飞实验室根据AMCA 210、GB/T 1236标准，为EC风机建有可测得风量范围300-30000 m³/h的两座风室。英飞实验室是中国大陆第一家获得AMCA实验室认可的实验室。英飞风室可以进行各大小型号风机的性能试验，确保在EC风机的研发和生产过程中，风量和风压等性能满足客户的实际需求。

As the first AMCA accredited laboratory in Mainland China, the INFINAIR laboratory includes two air chambers built specifically for the EC fan conforming to AMCA 210 and GB/T 1236 standards and testing airflows ranging from 300-30000 m³/h. The chambers serve for performance measurement of fans of different size categories. They help ensure that in designing and producing the EC fan, the airflow, pressure and other performance parameters meet customer requirements.

噪声试验: Sound Test:

英飞实验室根据GB/T 6882标准和ISO 3745标准建有噪声检测用半消声室，测试设备采用世界一流丹麦B&K品牌，可测试风机、电机在三分之一倍频程下的噪声数值，为英飞风机的噪声控制提供了可分析依据，确保了英飞风机的低噪声。

The INFINAIR laboratory includes a semi-anechoic room conforming to GB/T 6882 and ISO 3745 standards and equipped with B&K test instruments imported from Denmark. They can test the sound pressure level of the motor and fan in one-third octave bands, providing analysis data for sound control and ensuring low sound of INFINAIR fans.



盐雾试验: Salt Spray Test:

腐蚀是材料或其性能在环境的作用下引起的破坏或变质。英飞实验室根据GB/T 2423.17与GB/T 2423.18标准，对于产品各材料进行盐雾试验和防盐雾等级评定，通过人工加速模拟盐雾环境试验，确保英飞产品原材料的选取，可以满足客户对于产品的耐腐蚀性要求。

Corrosion is the deterioration of materials or performances as a result of chemical reactions between the materials and the surrounding environment. The INFINAIR laboratory performs salt spray test and rating on materials conforming to the GB/T 2423.17 and GB/T 2423.18 standards. The tests in simulated salt spray environment help ensure the materials used in INFINAIR products meet the customer requirements for corrosion resistance.

环境模拟试验: Environmental Simulation Tests:

英飞实验室根据GB/T 2423.1等标准，配有沙尘试验箱、淋雨试验机、程式高低温试验箱等，可以根据客户的实际需求，进行沙尘试验、淋雨试验、高温持续运行、低温持续运行、交变湿热运行等试验，模拟风机使用环境的变化与特点，确保风机在实际运行中的持续、稳定和可靠。

The INFINAIR laboratory has test chambers conforming to the GB/T 2423.1 standard among others for sand and dust, water spray and splash, programmable high and low temperature tests. All these simulate real operating conditions to ensure continuous, reliable and stable fan operation.





▲ 英飞淋雨试验机正在测试
INFINAIR water spray and splash test machine is running



▲ 英飞高低温试验箱正在测试
INFINAIR high and low temperature test-box is in operation

英飞柔性制造与敏捷供货

Flexible Manufacturing and Quick Delivery

- A.** 自动化流水线生产，智能且高效
Smart and efficient automatic flow line
- B.** 精细的过程工艺控制
Precise process control
- C.** 耐受恶劣和变化剧烈之应用环境的制造经验积累
Rich experience in manufacturing products resistant to high variability and extreme environments
- D.** 强大和先进的实验验证能力
Strong and advanced testing capability
- E.** 优质组件：免维护轴承，优选的电路元器件和一体成型注塑叶轮等
High Quality Components: Maintenance-free bearing, carefully chosen circuit elements and impeller made by plastic injection molding, among others
- F.** 严格的现场质量管控
Strict on-site quality control program
- G.** 6 Σ 体系
6 Σ system
- H.** 机器人焊接工艺
Robot welding technology
- I.** 敏捷的精益生产
Agile production
- J.** 在线测功、动平衡和通讯检测，确保质量可靠
Power test, dynamic balancing test and communication test performed online



▲ 英飞绕线机正在高速工作中
INFINAIR coil winding machine is working at a high speed



飞鹰服务
Eagle Service

联合研发：
通过与客户共同开发，以及质量先期策划，来快速提供真正有效的解决方案。
Joint R&D: INFINAIR partnering with customers on R&D through Advanced Product Quality Planning (APQP) to provide fast and effective solutions.

配套定制：
我们的定制服务通过渐进明晰的过程，帮助您找到精确的需求。
Customization Services: Our customization services offered through progressive elaboration helping identify and meet your needs.

敏捷服务：
遍布全国的英飞售后服务工程师，敏捷提供专业服务。
Agile Services: INFINAIR engineers stationed across the whole country ready to provide professional and agile services.

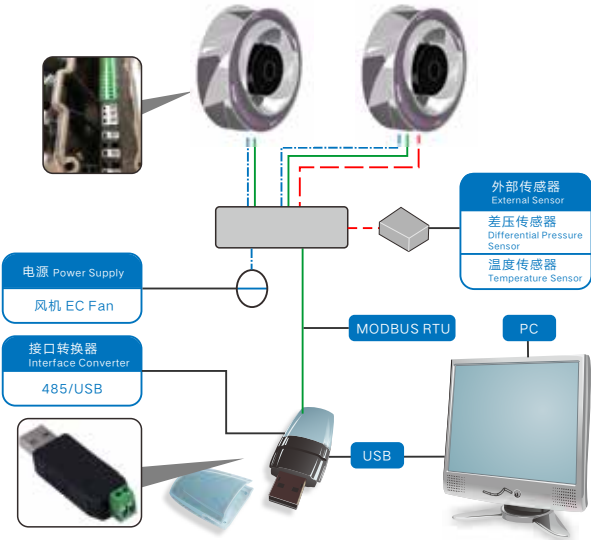
英飞智能通风监控系统
INFINAIR Smart Ventilation Monitoring System

智能需求感知
Smart Load Identification
随荷载变动、环境变化动态确定运行目标。
Dynamically adjusting the operation target to the changing load and environment.

智能工况调整
Smart Operating Conditions Adjustment
永磁同步技术在智能调控软件的动态控制下，紧密贴近真实需求。
The permanent magnet synchronization motor technology dynamically and smartly controlled by software to meet real needs.

智能实时通讯
Smart Real-time Communication
通过多种通讯技术，链接互联网或局域网，实现与中控系统及移动终端的智能通讯。
Smart communication with central control system and mobile terminals by connecting with the Internet or Intranet.

智能预警
Smart Warning
可靠的传感器感知了故障的早期征兆，智能预警，保证系统稳定运行。
Early signs of failures smartly detected and warned by the reliable sensors to ensure stable operation.



物联
Connectivity
智能互联、中控互联、终端互联
Interconnected matrix, interconnected central control system and interconnected terminals.

认证
Certifications

产品普遍通过国际认证：CCC、AMCA、TUV、UL、RoHS、ErP2015等
INFINAIR products are obtaining many international certifications: CCC, AMCA, TUV, UL, RoHS, ErP2015 and so on.

