



INDUSTRIAL PROCESS AND  
COMMERCIAL VENTILATION SYSTEMS



## EC PLENUM FANS



BY TWIN CITY FAN & BLOWER

FEBRUARY 2025

[WWW.TCF.COM](http://WWW.TCF.COM)

## Applications We Support

Fan Walls / Arrays

Air Handler Units

Computer Room Air Handlers

Rooftop Units

Computer Room Air Conditioners

Industrial



## Markets We Serve

Data Centers

Airports

Skyscrapers

Hospitals

Hotels

Universities

Labs

Factories

Industrial



## Introducing TCF's EC Plenum Fan Systems

Twin City Fan & Blower, the world's largest supplier of plenum fans, now offers Electronically Commutated (EC) Plenum Fan Systems, part of the GridSmart™ EC Fan Systems Series. Our EC Plenum Fans include EC motors and provide industry-leading performance. The fans meet DOE regulations (FEI), integrate with HVAC and building controls, improve efficiency, and save time and money.

- **Floor Mounted Designs** offer standard NEMA foot motor mounting, narrow inlet funnel and spring isolator base. For horizontal mounting.
- **Wall Mounted Designs** with pad motor mounting, narrow inlet funnel and slim profile. Can be mounted horizontally or vertically.



Floor Mounted



Wall Mounted

## Regulation Compliance

Energy efficiency and sustainability is being driven by industry regulations, standards and certifications, such as Fan Energy Index (FEI). We understand these regulations and standards, are working to comply with them, and know how they affect you.

Regulations are established and adopted:

- Department of Energy (DOE)
- California Energy Commission (CEC) and other states
- ASHRAE
- AHRI
- AMCA



U.S. DEPARTMENT OF ENERGY



CALIFORNIA ENERGY COMMISSION

## Testing and Manufacturing Capabilities

Our AMCA accredited test lab ensures that our published ratings are based on tests and procedures performed in accordance with AMCA Publication 214 (fan energy index), 210/211 (air performance), 300/311 (sound performance) and comply with the requirements of the AMCA Certified Ratings Program.

We are also investing in our South Dakota manufacturing facilities:

- Automated high-capacity plenum fan impeller fabrication
- Added additional motor mounting hardware fabrication capacity
- Added Kanban system for raw material inventory
- Added dedicated high-volume assembly lines
- Added additional fan system balancing stations
  - AMCA 204-20 specifies balance and vibration tolerances
    - BV-3 fan balance tolerance performed
    - Vibration trim balancing if necessary



Minneapolis, MN  
Research and Development Lab



Elkton, SD  
Manufacturing Facility



## Impeller Options

TCF provides two fan impeller options with a variety of sizes to maximize performance over a broad range of applications. These impeller options allow for an optimized solution by taking air performance, sound performance, efficiency and cost into account.

### 9-Bladed Impellers

- High efficiency, aluminum welded airfoil impeller
- Air performance up to 18,000 CFM and 8" w.g. static pressure
- Max. static efficiency = 67%
- Max. total efficiency = 71%



### 7-Bladed Impellers

- High efficiency, aluminum welded airfoil impeller
- Air performance up to 18,000 CFM and 8" w.g. static pressure
- Max. static efficiency = 75%
- Max. total efficiency = 78%



With 9-bladed and 7-bladed impeller options, we can meet required wire-to-air efficiency and FEI requirements. FEI is a metric used to measure the energy efficiency of fans. It compares the actual electrical power consumption of a fan to a reference fan at the same duty point. FEI focus is on the entire fan/motor system. The higher the FEI rating, the more efficient a fan will be for a given duty point.

Following are some examples to take into consideration during fan selection and motor sizing.

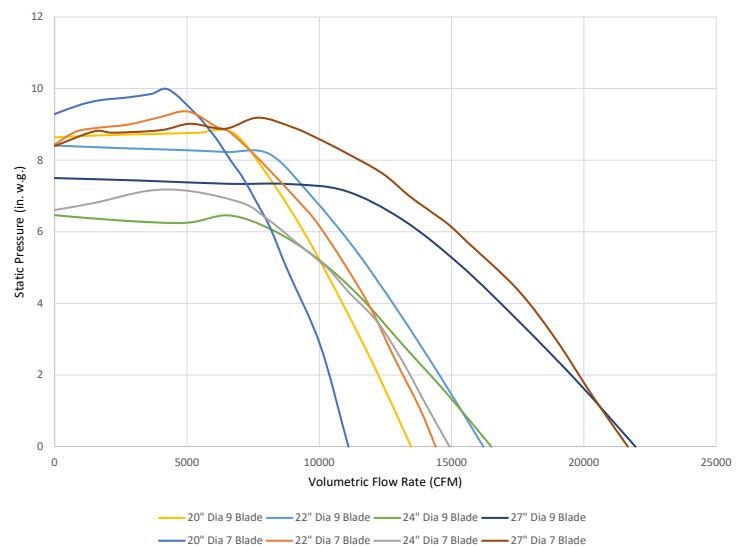
#### Example 1

EC Plenum Fan selection at a duty point of 9,500 CFM and 2.4" w.g.

- TCF 22" fan (57.9%) and EC motor 7.5 HP, 1,800 RPM operating at 1,800 RPM (90.7%) = wire-to-air efficiency (51.9%) and FEI (1.22)
- TCF 24" fan (66.7%) and EC motor 7.5 HP, 1,800 RPM operating at 1,500 RPM (90.1%) = wire-to-air efficiency (60.1%) and FEI (1.40)

This illustrates that for 22" and 24" fans operating at the same duty point with the same motor at different operating speeds, the 24" fan is more efficient with lower operating costs, but the upfront cost will be slightly higher.

### Impeller Performance Ranges



#### Example 2

EC Plenum Fan selection at a duty point of 11,000 CFM and 4.0" w.g.

- TCF 24" fan (70.0%) and EC motor 10 HP, 1,800 RPM operating at 1,800 RPM (91.8%) = wire-to-air efficiency (64.3%) and FEI (1.36)
- TCF 27" fan (75.0%) and EC motor 15 HP, 1,800 RPM operating at 1,399 RPM (90.3%) = wire-to-air efficiency (67.7%) and FEI (1.46)

This illustrates that for 24" and 27" fans operating at the same duty point but matched with different HP motors at different operating speeds, the 27" fan is more efficient with lower operating costs, but the upfront cost will be slightly higher.

## Motor Options and Specifications

Twin City Fan offers a variety of EC motors from industry-leading manufacturers.

### Wall Mount

- Infinitem's Aircore EC axial flux motor includes an innovative copper-etched PCB stator technology and rotors with neodymium magnets.

### Floor Mount

- Wolong's EMR EC motor is a ferrite permanent magnet assisted synchronous reluctance motor and top-mounted VFD.

### Wall and Floor Mount

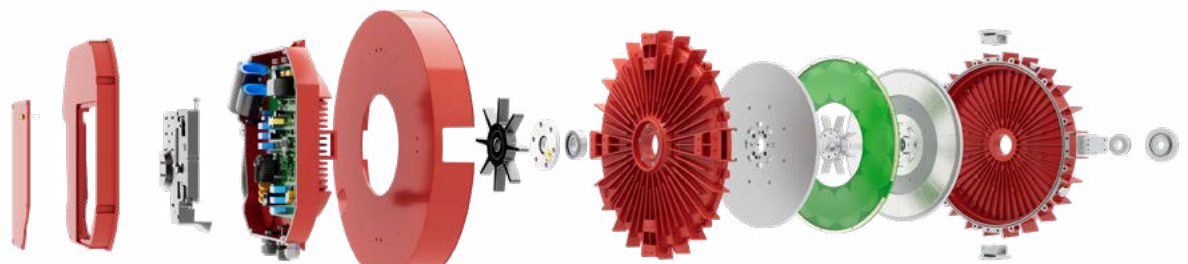
- WEG's W30 Smart EC motor is a spoke ferrite permanent magnet electronically commutated motor and rear-mounted VFD.

### All Three EC Motors include:

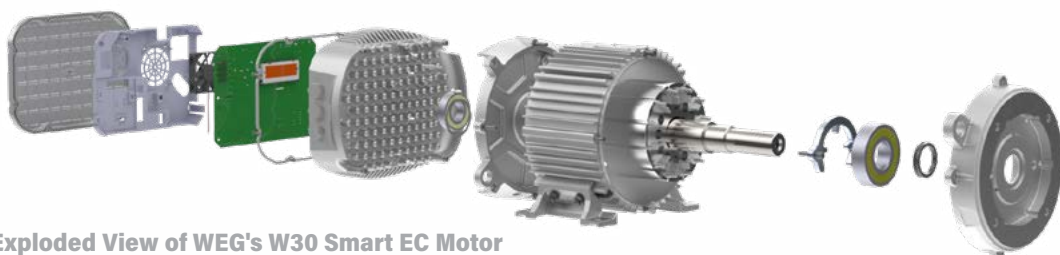
- Integrated state-of-the-art VFDs, allowing precise speed control, reduced energy usage and operation at frequencies that minimize audible noise
- Motor control software that enables users to fine tune operational parameters to specific applications.

EC motors are offered with numerous standard features to meet specific requirements for the application.

- Horsepower range: 5, 7.5, 10 and 15 HP
- RPM options: 1800, 2400, 3600 (300-3600 range)
- Voltages: 460, 415 and 575
- Motor lengths: 8.6" – 16.5"
- Motor widths: 11.9" – 21.5"
- Motor weights: 72 – 128 lbs.
- Operating temperature: -25°C to 60°C
- ETL or UL certification



Exploded View of Infinitem's Aircore EC Motor



Exploded View of WEG's W30 Smart EC Motor

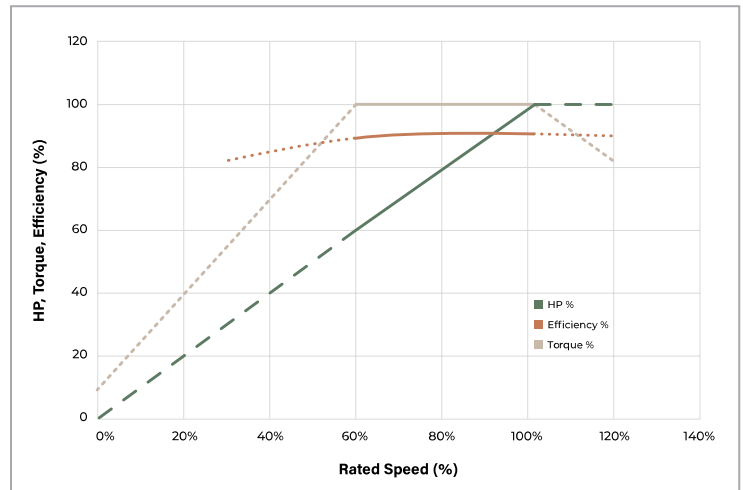
## Operating Range and Custom Configuration

EC motors are pre-configured at the EC motor manufacturer's factory. Variable speed control allows a standard motor to operate at an optimal RPM to meet a selected fan duty point (flow and pressure).

When an EC motor rated RPM is reduced, HP, amps and torque are also reduced. For example, a standard 10 HP, 1,800 RPM EC motor operating at 1,225 RPM will have reduced HP from 10 HP to 5.9 HP, reduced Amps from 12.0 A to 8.1 A and reduced torque from 40.0 Nm to 34.3 Nm. High system efficiency is maintained over a flat efficiency curve.

EC motors can be custom-configured by an OEM using the EC motor manufacturer's EC motor control software or ordered custom-configured from the EC motor manufacturer's factory with a custom nameplate. Custom-configuration ensures a maximum RPM to optimize the EC motor for a fan duty point and allows wires and fuses to be sized to the lower rated amps.

### EC Motor System Performance



Variety of EC Motors

## System Accessories

### Piezometer Ring Airflow Measuring System (standard on all fans)

- The inlet cone of the fan is used as the flow nozzle and flow is calculated by measuring the pressure drop.
- The system consists of a piezometer mounted at the throat and one static pressure tap mounted on the face. Contact TCF if a ring with additional taps is needed.
- The pressure drop is measured from the tap located on the face of the inlet cone to the piezometer ring in the throat. The inlet tap is connected to the high pressure side of the transducer and the piezometer ring is connected to the low pressure side.

### Spring Isolator Brackets (standard on floor-mounted fans)

- Provide a common support to fan, motor and drive. Used to prevent fan vibrations from being transmitted to the support structure.

### Safety Screens (optional)

- Inlet screens (mounted to the fan inlet) and outlet screens (for floor-mounted motors).

### Harmonic Mitigation (optional)

- Offered with external passive filters from leading filter manufacturers.

## Control Software

EC motor suppliers develop control software specific to their motor so users can make adjustments to the motors as conditions change. Control software allows for compliance with DOE regulations.

Motor control software allows:

- Speed control
- Custom configuration (if changes to the standard factory configuration are needed)
- Monitoring (operational health and efficiency)

Criteria	Monitoring and Control
<b>Speed Control</b>	Modbus RTU or Analog 0-10V
<b>Parameter Settings</b>	Direction Control, Min/Max RPM, Acceleration/Deceleration Ramp, Skip Speeds (to avoid resonance), Fault Reset
<b>Temperature Sensors</b>	Thermal overload protection for motor/electronics: Temperature of Stator, Inverter Board, Heat Sink and CIM Board
<b>Graphical or Digital Display</b>	Real time display of motor status: Speed (RPM), DC Bus Voltage (V), Average RMS Current (A), Stator Temperature (C), Power Output (W), Torque (Nm)

## System Level Intelligence and Control

TCF offers EC Plenum Fan Systems with built-in intelligence that integrates as part of a system level control design.

### Building Management System (BMS) Controls

A building management system (BMS) monitors and controls a building's mechanical and electrical systems, and can interface with HVAC equipment controls and TCF EC Plenum Fans.

### HVAC Equipment Controls

HVAC controls regulate the operation of HVAC equipment, can take the lead to compare the current state to a target state, and can take action to control the operation of TCF EC Plenum Fans.

### Motor Controls

TCF EC Plenum Fans include EC motors with an integrated VFD and control board, provide monitoring and variable speed capability, and can interface with both a BMS and HVAC equipment controls.



Building Management System



# INDUSTRIAL PROCESS AND COMMERCIAL VENTILATION SYSTEMS

CENTRIFUGAL FANS | UTILITY SETS | PLENUM & PLUG FANS | INLINE CENTRIFUGAL FANS

MIXED FLOW FANS | TUBEAXIAL & VANEAXIAL FANS | WALL MOUNTED FANS | ROOF VENTILATORS

CENTRIFUGAL ROOF & WALL EXHAUSTERS | CEILING VENTILATORS | GRAVITY VENTILATORS | DUCT BLOWERS

RADIAL BLADED FANS | RADIAL TIP FANS | HIGH EFFICIENCY INDUSTRIAL FANS | PRESSURE BLOWERS

LABORATORY EXHAUST FANS | FILTERED SUPPLY FANS | MANCOOLERS | FIBERGLASS FANS | CUSTOM FANS



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