COOK®

Why Should I Use EC Motors and Controls?

Cook Vari-Flow® FAQ

Vari-Flow®

Motors and Compatible Controls

Is your fan running more than it should?

Cook Vari-Flow® motors and controls allow you to move the precise amount of air you need simply and effectively

What is Cook Vari-Flow?

- *Vari-Flow is the brand name that Cook uses to refer to our line of EC motors and compatible controls.*
- *It encompasses EC and PM motors, SimpliDrive (pre-wired, pre-programmed, pre-installed VFD's) and our line of controls and monitoring components.*

Air Balance Kit

Remote Speed Controller

2-Speed Controller

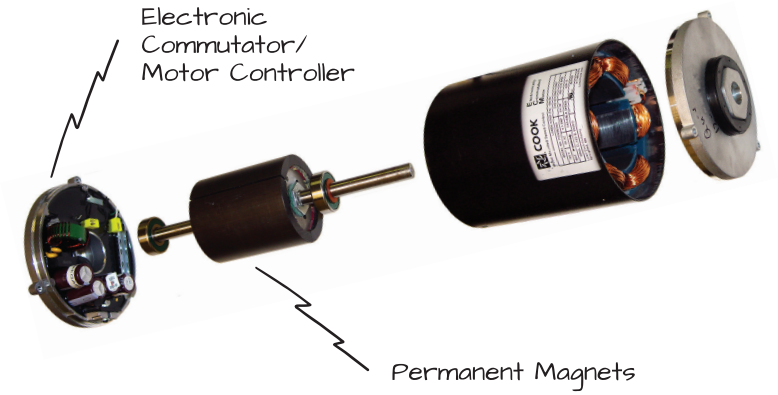
Pressure Controller

Flow Monitor

IAQ Controller

SimpliDrive

Vari-Flow motors are long-lasting and low maintenance. No belts, no brushes. Vari-Flow controls allow you to control your ventilation equipment, simply and economically!



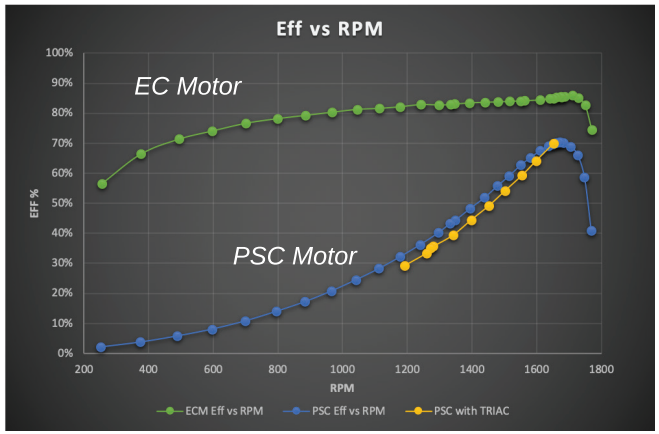
What is an 'EC' motor and how does it differ from a traditional motor?

- *EC means 'electronically commutated'.*
- *This simply means that electronic components control the speed and direction of the motor rotation.*
- *EC motors replace the 'squirrel cage' in the motor rotor with permanent magnets.*

What is Cook Vari-Flow?

You mention permanent magnets. I have also heard of permanent magnet (PM) motors. Are they different than EC motors?

- *All EC motors use permanent magnets to replace the rotor squirrel cage.*
- *All permanent magnet motors are electronically commutated.*
- *The difference is that an EC motor commutator/controller is supplied by the motor manufacturer (and usually integrated into the motor), whereas the PM motor controller is provided by a supplier other than the motor manufacturer.*



Speed vs. Efficiency

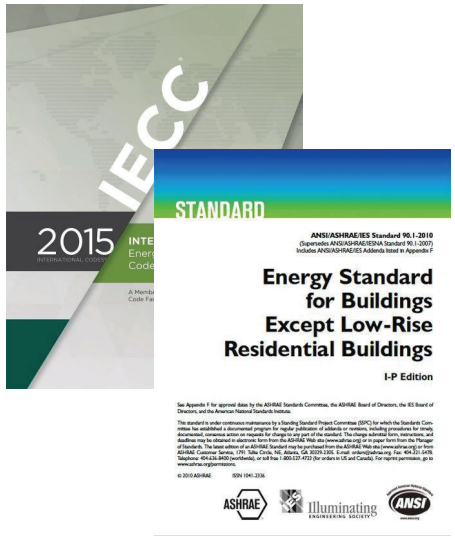
Are Vari-Flow EC motors more efficient than a traditional AC induction motors? If so, why?

- *EC (and PM) motors use permanent magnets to replace the squirrel cage in the rotor.*
- *Motor rotors in AC induction motors incur losses due to phenomena known as hysteresis, eddy currents, and ohmic losses.*
- *By using magnets in the rotor, up to 20% of motor losses are eliminated. These losses increase significantly at part load due to increased motor slip. EC motors are 'no-slip' motors, so losses are relatively flat over the speed range.*

Requirements and Economics

Are there other advantages to EC motors?

- *Motor losses generate heat. The greater the losses, the more heat is generated.*
  - *With the reduced losses of EC and PM motors, they will run cooler and more efficiently than traditional AC motors.*
- *Controllability - Cook Vari-Flow EC motors provide access to a wide range of controls.*
  - *Our controls are compact, simple to install, and easy to use.*
  - *Compared to traditional AC induction motors with VFD's and controls, Cook fans with Vari-Flow motors and controls are economical as well.*
- *Simplifies installation - With the controller being integrated and provided by the motor manufacturer, there are no VFD's to specify, procure, install, commission or program. All of that is taken care of.*



Are EC motors ever required by codes or standards?

- *The International Energy Conservation Code (2015 and later) requires that motors of 1 hp or less have an efficiency of at least 70% or are EC motors. That generally precludes everything but EC motors.*
- *ASHRAE 90.1-2010 and later also have this requirement for motors from 1/12 to 1hp.*
- *As of the publication of this flyer, 21 states had adopted the 2015 IECC or later.*

If you are interested as to the adoption of these codes/standards in your state, you can find this information at:
https://www.energycodes.gov/state-code-adoption-tracking-analysis

Do fans with EC motors cost more than fans with AC motors?

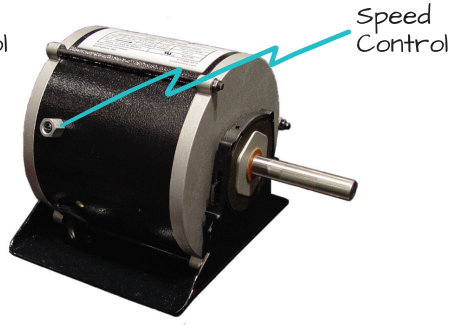
- *In general, fans with EC motors cost more than fans with AC motors.*
- *If an EC motor is not required by code and your are going to run the fan continuously at one speed, a traditional AC motor will work just fine.*
- *However, if you wish to control the speed of the fan, based on an input signal from some controller, Vari-Flow motors and controls are normally less expensive than an AC motor, VFD and third party controls; and are designed to make the installation simple.*

Vari-Flow motor + controls < AC motor + VFD + 3rd party controls

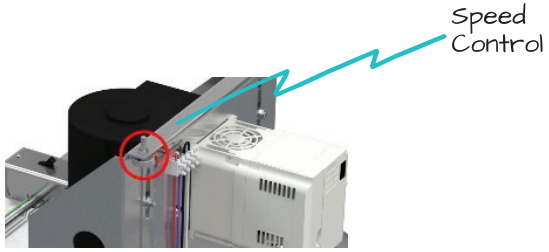
What if I need an EC motor but just want to set the speed and leave it there?

- *For this application, 'Fan Mounted' speed control is the option you want.*
- *The manual speed control for Vari-Flow EC motors (VF selections) this will normally be mounted on the motor and is standard.*
- *For PM motors (VF2 selections), 'fan-mounted speed control' must be specified.*

EC Motor with LED Readout



EC Motor without LED Readout



PM Motor and Controller

Fan-Mounted Speed Control locations vary based on motor and fan type. Above are the three most common speed pot locations

Do I need a VFD with EC or PM motors?

- *As stated before, EC motors are provided by the motor manufacturer with an integrated controller.*
- *PM motors require a controller (VFD) to tell the motor what direction and how fast to rotate.*
- *The PM motor controller must be 'PM compatible'.*
- *The PM controller cannot be bypassed as the motor will not operate. When using Compute-a-Fan to select direct drive fans with controls, PM selections will show up as 'VF2'.*
- *VF2 selections will have a PM motor and a PM Motor Control that is factory-installed, pre-wired and pre-programmed.*
- *You do not have to specify any features or parameters for the controller.*

Motor and Product Offering

What are the horsepower ranges of Vari-Flow motors?

- *As of the date of this publication, Vari-Flow EC motors range up to and including 1hp.*
- *Beyond 1hp, Vari-Flow PM motors range up to 10hp.*
- *This is constantly evolving so if your needs are greater than this, contact your local Cook Rep.*

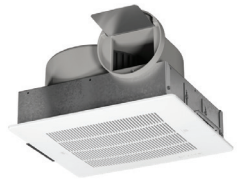
What voltages can I get Vari-Flow motors in?

- *In general, Vari-Flow EC motors are available in 115/208-277V, single phase.*
- *Vari-Flow PM motors are generally available in 220-230V, single and three phase and 460V, 1 and 3 phase*
- *We are constantly seeking to expand the offering, so if this does not meet your needs, contact your local Cook rep*
- *Gemini fans are available in 115V (sizes 500, 700, 900) and 115/230V (sizes 100 and 300)*

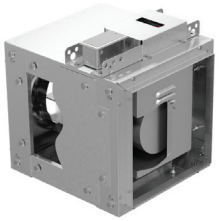
A Motor Availability Matrix is kept current and available from the Cook website at:
https://lorencook.com

What Cook models offer Vari-Flow motors?

- *Vari-Flow motors are offered on ACE, ACRU, ACW, HLC, TLC, TCN, VCR, CP, SQN, TMX, Gemini, XWD/XPD and ERV.*
- *We are continually expanding the offering, so contact your local Cook Rep if this does not meet your needs.*



Gemini



SQN

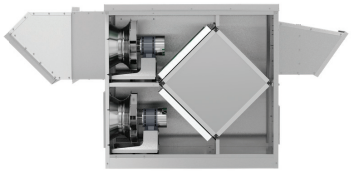
ACE

TMX

CP

ACRU/VCR

XWD/XPD



ERV/ERVX

Can Vari-Flow motors be applied to belt drive fans?

- *EC motors typically do not have enough startup torque to address belt drive applications.*
- *Integral horsepower PM motors can be applied to belt drive applications, however, an AC motor with SimpliDrive (pre-wired, pre-programmed, factory-installed VFD) is often a lower cost way to add access to Vari-Flow controls if that is the reason for the request.*

What is the life expectancy and reliability of Vari-Flow motors?

- *Based on tens of thousands of motors we have sold in the past decade, every indication is that EC motors last as long as traditional AC induction motors, and that their reliability over that life is as good.*

How readily available are Vari-Flow EC replacement motors?

- *Cook keeps an ample stock of Vari-Flow EC motors on hand.*
- *Next day delivery of replacement motors is generally available under normal conditions.*
- *Contact your local Cook rep for more information.*

Can I retrofit a Vari-Flow EC motor on an existing fan?

- *Although this could potentially be achieved, it will generally be easier and more cost effective to replace the fan in question with an entire Vari-Flow fan-motor package.*

Are Vari-Flow EC and PM motors 'Premium Efficient'?

- *The term 'Premium Efficient' applies to NEMA Design A and B, 3-phase AC induction motors from 1 to 500 hp, excluding both EC and PM motors from this classification.*
- *Fractional hp EC motors are, however, significantly more efficient than identical hp AC motors, especially at part load.*
- *Integral horsepower PM motors will generally be as efficient as Premium Efficient AC motors.*

What is the operating temperature range of a Vari-Flow motor?

- *-34F to 104F (-29C to 40C) which is acceptable in most operating conditions.*

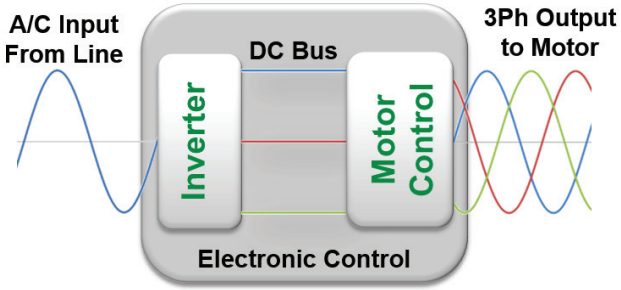
Are Vari-Flow EC motors thermally protected?

- *The controller on all Vari-Flow EC motors provide protection from thermal overload, locked rotor and over-current. While this accomplished electronically, in many ways it is superior to the optional thermal protection available for AC induction motors.*

The motor controller for both EC and PM motors provides many of the functions that are optional for AC induction motors. The protections mentioned above are standard for Vari-Flow motors

Do EC motors require motor starters?

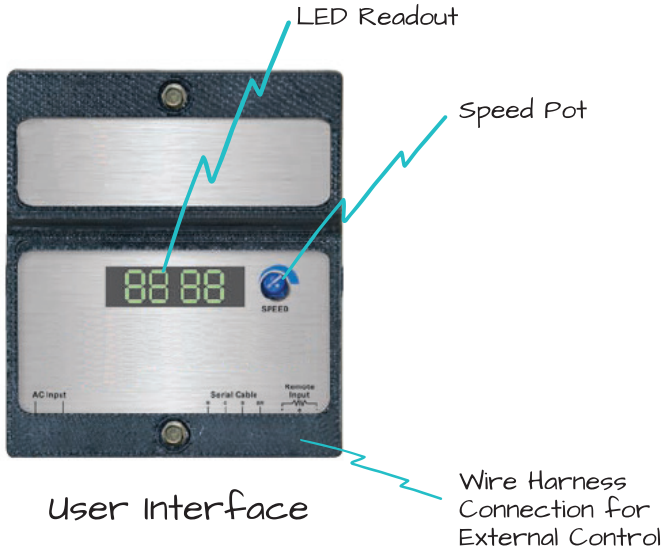
- *The EC motor controller provides all of the required protection and functionality that a starter provides.*



This simplified schematic of an EC controller shows some of the functionality of an EC motor controller. The controller takes AC input power, converts it to DC, opening and closing transistors based on an input signal to control speed and rotation. Soft start and motor protections are built into the controller.

Some Vari-Flow EC motors have LED readouts? What do these do?

- *This user interface (UI) is connected to its EC motor using a cable that communicates with the motor controller. The UI is not the controller.*
- *It has an LED readout that displays motor RPM and percent of the motor max speed.*
- *A speed potentiometer is located on the user interface to manually control the speed of the motor when no external control is desired.*
- *When external control is required, this speed pot must be turned fully counterclockwise to allow for the remote input signal from a controller or BMS. (Vari-Flow EC Motors without this UI require speed pot to be turned fully clockwise.)*



User Interface

What kinds of controls are available for Cook Vari-Flow motors?

- *Cook has temperature, humidity, CO2, VOC, 2-speed and manual speed control.*
- *Additionally, the Cook Flow Monitor provides a simple means of monitoring airflow knowing just the fan model and size.*
- *The Vari-Flow SimpliDrive allows AC motors to be controlled by Vari-Flow controls.*







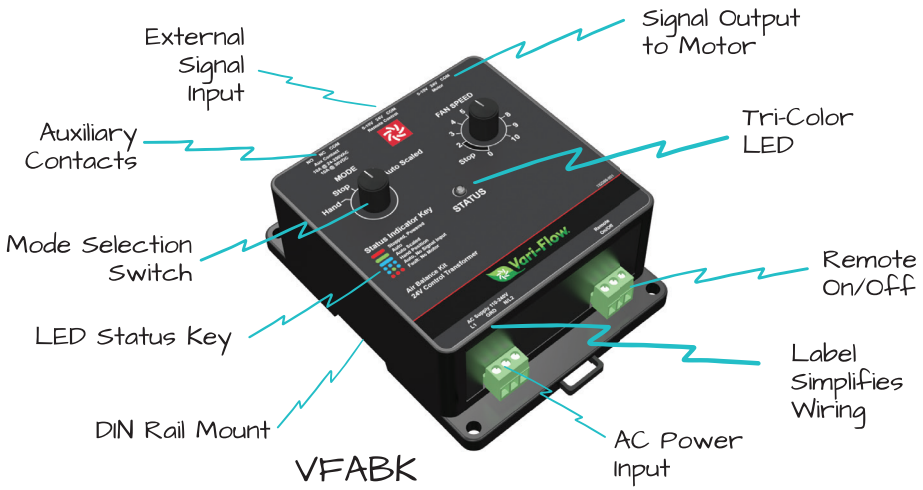
Air Balance Kit (VFABK)	Remote Speed Control (VFRSC)	2-Speed Controller (VF2SC)	Pressure Controller (VFPC)	Flow Monitor (CFM)	IAQ Controllers (VFTC, VFHC, VFCO2, VFVOC)	SimpliDrive Pre-wired, pre-programmed, factory-installed VFD

How do Vari-Flow motors and controls vary fan speed?

- *Vari-Flow motors accept a 0-10V control signal.*
- *Vari-Flow controls measure the difference between the desired setpoint and current condition and convert that difference into a 0-10V signal, which is then sent to the motor, causing it to speed up or slow down.*

What is the Air Balance Kit (VFABK)

- *The Vari-Flow Air Balance Kit is the lynch pin of the Vari-Flow control offering and is included with most control options (except 2-speed controller).*
- *It contains a 24V control transformer to power the control circuit, provides a single point of connection for all components in the control circuit including the motor, and is labeled to simplify wiring.*
- *The Air Balance Kit also provides a great deal of functionality including manual override speed control, external 0-10V input and top end signal output limit.*



Control Types

More Considerations

Can I interlock a damper, another fan, or other piece of HVAC equipment with a Vari-Flow controlled fan?

- *The Vari-Flow Air Balance Kit (VFABK) provides a couple of ways to interlock another piece of equipment.*
- *One way is to activate the other device via the auxiliary contacts on the VFABK. These contacts can accept low voltage DC up to 24VDC (10A max) as well as AC voltage up to 250 VAC (10A max)*
- *Another way to interlock a device is to enable/disable the VFABK using an interlock relay on the other device, connecting to the VFABK remote on/off contacts.*
- *Both are simple to wire and easy to employ.*

External device tells the 2-Speed Controller to Run at 'A' or Run at 'B'

What does the 2-Speed Controller (VF2SC) need to change fan speed?

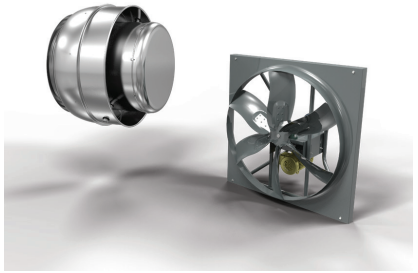
- *The 2-Speed Controller requires an external device to tell it at which speed to run the fan, high or low.*
- *This external device can be a single pole, double throw (SPDT) switch, a relay, a BMS system, a timer, an occupancy sensor or some other device to 'tell' the VF2SC to run at speed A or to run at speed B.*
- *High and low speeds are individually set to meet your exact needs.*
- *No expensive 2-speed motor or 2-speed starter required!*

Can Vari-Flow controls interface with building management systems?

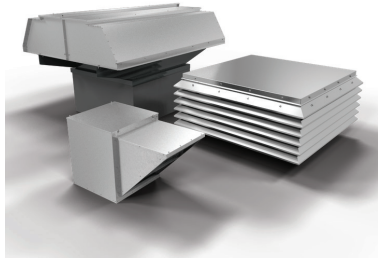
- *The Vari-Flow IAQ controllers (Temperature, Humidity, CO2 and VOC) are optionally available as BACnet and Modbus compatible.*
- *The remainder of the controllers can interface with BMS/BAS systems through the 0-10V inputs and outputs as well as remote on/off contacts on the Air Balance Kit (VFABK).*
- *The 2-speed controller does not require the Air Balance Kit to operate and has the same remote on/off and 0-10V out as the VFABK.*

For more information about Vari-Flow motors and controls, contact your local Cook rep or visit our website at lorencook.com

At Cook, we move air. We're experts at it. As innovators in air moving equipment for 80 years, we've grown into one of the largest and most respected fan and blower manufacturers in the world.

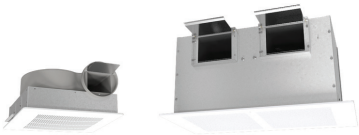


With 1,000,000 square feet of manufacturing under roof and over 250 products, Cook is still innovating and expanding to meet the needs of our customers. State-of-the-art R&D, quality manufacturing and the industry's best training.



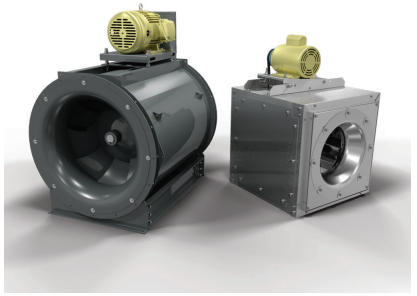
We are proud of our tradition and dedicated to staying on the leading edge of fan and blower technology.

LOREN COOK COMPANY 80 1941-2021

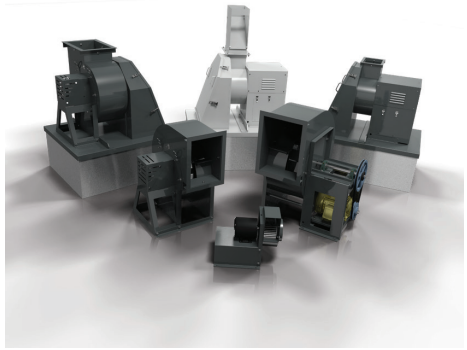


With state-of-the-art R&D and manufacturing capabilities, we design our fans right and build them to last.

Cook, leading the industry in air movement since 1941.



Need to move 30 CFM? How about 300,000 CFM? Either way, we can help.



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