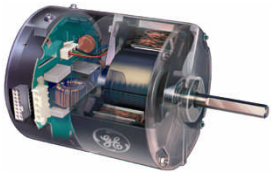
Overview of ECM Technology

What is ECM technology? ECM (Electronically Commutated Motor) technology is based on a brushless DC permanent magnet design that is inherently more efficient than the shaded-pole and permanent-split-capacitor (PSC) motors commonly found in air handlers, furnaces, heat pumps, air conditioners and refrigeration applications throughout the HVACR industry. By combining electronic controls with brushless DC motors, ECM's can maintain efficiency across a wide range of operating speeds. Plus, the electronic controls make the ECM programmable, allowing for advanced characteristics that are impossible to create using conventional motor technologies.

PSC Motor

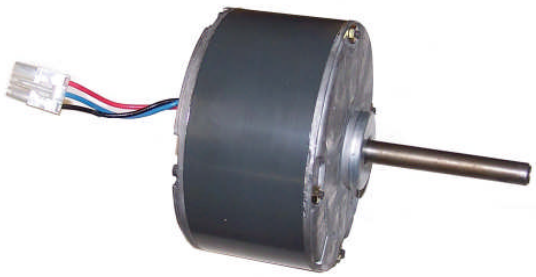
Early HVAC literature listed these motors as **ICM (Integrated Control Motor)**, meaning that a control was integrated or used in conjunction with a motor to control its operation. This was later changed to **ECM (Electronically Commutated Motor)** as they are typically referred to today. The definition of commutate is to reverse the direction of an alternating electric current (the means by which all electric motors rotate). In an ECM this process is controlled electronically by a microprocessor and electronic controls, which provides the ability to program and control the speed and/or torque of the motor.



The GE ECM™ motor, currently used by most residential HVAC systems is a brushless DC, three-phase motor with a permanent magnet rotor. Motor phases are sequentially energized by the electronic control, powered from a single-phase supply. These motors are actually made of two components, a motor control (control module) and a motor, sometimes called a motor module.

Motor Control (Control Module)

Motor (Motor Module)



The motor control is the brains of the device, where single phase (1Ø) 120 or 240 VAC 60 cycle (Hertz/frequency) power is connected. The control then converts AC power to DC power to operate the internal electronics, thus the name DC motor. The microprocessor in the motor control is programmed to then convert DC power (by means of electronic controls) to a three phase (3Ø) signal to drive the motor, thus the name Three Phase Motor. It also has the added ability to control the frequency (which controls the speed in revolutions per minute) and the amount of torque (current/power) it delivers to the motor.

The motor is essentially a three phase motor with a permanent magnet rotor. The permanent magnet rotor contributes to the electrical efficiency of the ECM and also to its sensor-less ability to control the rpm (revolutions per minute) and commutation (when to alternate the cycle). Typical DC motors require brushes to provide the commutation function. This is where the motor gets the name brushless DC motor.

The benefit of all of this technology is increased electrical efficiency and the ability to program more precise operation of the motor, over a wide range of HVAC system performance needs, to enhance consumer comfort.