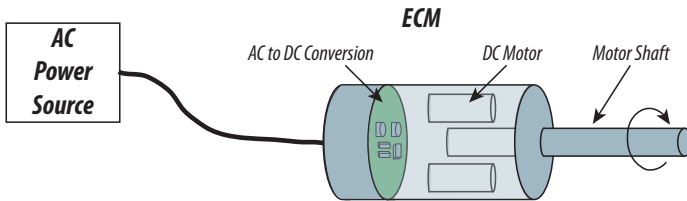


## Using Current Sensing Devices to Monitor Electronically Commutated Motors (ECMs)

### Introduction

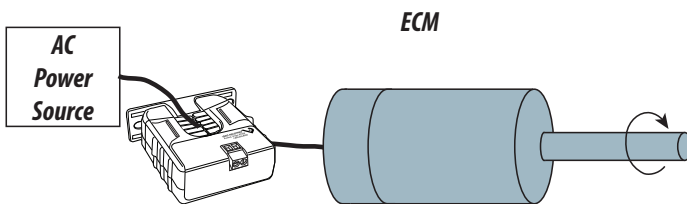
An electronically commutated motor (ECM) is a DC motor powered by an AC electrical source.



The DC motor has a microprocessor section, which acts as an AC to DC converter. The microprocessor also contains a circuit that controls the speed of the DC motor, so that the speed can be adjusted easily. The ECM draws AC power constantly, even when the motor is not turning. The minimum current drawn, known as the keep-alive current, occurs when the DC motor shaft is stationary. By increasing or decreasing this current, the motor speed is controlled and runs at the speed desired by the controller.

### ECM Monitoring

In many ECM applications, it is desirable to monitor the current. Since the motor is DC, many installers want to use a DC current monitor. Since all of the DC circuitry is internal to the ECM, monitoring the DC current is impossible. Instead, it is necessary to use a current monitor compatible with AC current, placed in series just before the ECM.



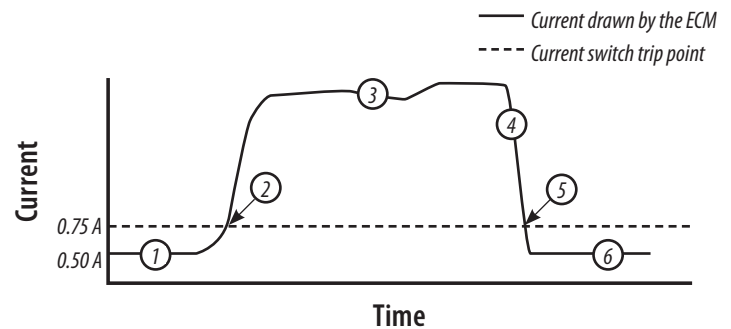
Monitoring can be accomplished in two ways, either using a current sensor with analog output or using a current switch.

### Analog Current Sensor vs. Adjustable Digital Current Switch

Monitoring with an analog current sensor allows the user to track the exact current drawn by the ECM. First, the installer must wire the sensor according to the instructions included with the device. Then the building controller software is scaled so that the monitored current range matches the analog output of the device (e.g. 4-20 mA). In this way, the precise amperage drawn by the ECM can be read at any time.

Monitoring with an adjustable current switch allows the installer to establish a trip point at which the switch changes state. First, the user must determine the keep-alive current for the ECM (i.e., the current drawn when the motor is connected to the AC power source, but the shaft is not turning). Second, the user must calibrate the adjustable current switch so that the trip point is slightly higher than the keep-alive current. In this way, a change in the monitored current represents an actual, real-time change in the speed of the ECM. Note that current switches with a fixed trip point are not appropriate for use in ECM applications.

In the example below, the installer has discovered that the keep-alive current for the ECM used in the application is 0.5 A. He has, therefore, set the trip point of his adjustable current switch to 0.75 A.



- ① The ECM is powered, but the shaft is not turning. The ECM draws the keep-alive current only.
- ② As the shaft begins to turn, the current increases. When the current passes above the trip point of the switch, the status of the switch changes state.
- ③ During normal operation, the ECM draws a stable current.
- ④ When the ECM experiences mechanical problems, the monitored current drops sharply.
- ⑤ When the monitored current drops below the trip point, the current switch changes its status again and sends an alert to the control system.
- ⑥ The ECM is no longer operating (shaft is not turning), but as long as it remains connected to the AC power source, it continues to draw its characteristic keep-alive current.

*The information provided herein is intended to supplement the knowledge required of an electrician trained in high voltage installations. There is no intent to foresee all possible variables in individual situations, nor to provide training needed to perform these tasks. The installer is ultimately responsible for ensuring that a particular installation remains safe and operable under the specific conditions encountered.*