Solid State Hall Effect Sensors

Application Note

Industry: Consumer

Application: Sensing Proof of Airflow in Gas-Fired Furnace

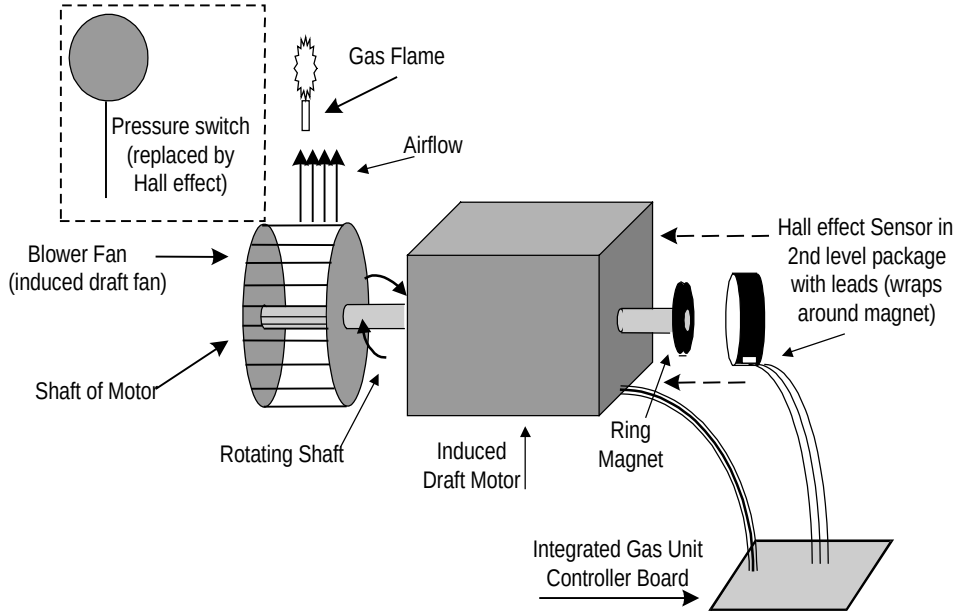

Figure 1. Hall effect sensor in “proof of airflow” application

Background

Gas furnaces are required by the American Gas Association’s American National Standard Institute (ANSI) for Gas-Fired Central Furnaces to provide “proof of airflow” in an induced draft or power burner. If the induced draft fan becomes inoperative on a furnace, the application prevents gas flow to the main burner(s) and pilot burner(s). “Proof of airflow” monitoring ensures that the induced draft fan is operating and has enough induced air draft for proper gas ignition.

Pressure switches or centrifugal switches are typically used for proving airflow. Pressure switches are the primary method of proving airflow in HVAC applications. They are low cost, reliable, and widely accepted in the industry. Centrifugal switches, an older technology, are used in commercial rooftop applications that have not been upgraded to use a pressure switch.

Application

A pressure switch generally detects proof of airflow in a gas furnace. A Hall effect sensor, however, can detect the rotation of the induced draft motor’s shaft. In this application, the Hall effect sensor provides a signal to the integrated gas unit’s controller board indicating proof of sufficient airflow in the gas furnace for proper ignition.

Why Hall Effect?

ANSI standards permit the use of a pressure switch, a centrifugal switch, or an equivalent device to prove airflow in a gas furnace. A solid state digital sensor and a ring magnet directly mounted on the induced draft motor fan shaft meets ANSI “proof of airflow” standards.

The custom Hall effect sensor and ring magnet combination provide a substantial cost savings compared to the traditional pressure sensor or centrifugal switches. Use of the Hall effect sensor eliminates the cost of the switch and the associated hardware and tubing. Hall effect sensors provide superior reliability when compared to a mechanical device. Hall effect sensors will permit gas furnace manufacturers to determine the speed of the induced draft motor, when used as described in this application.

Honeywell Solutions to Customer Needs

Operation of a Gas Furnace with a Hall Effect Sensor

The integrated gas unit controller (IGC) is a circuit board that is designed to control combustion functions and blower motor timing. In this application using a Hall effect sensor, the IGC can ignite, maintain, and check burner flame operation.

When a thermostat signals for heat, the induced draft motor (IDM) is energized. With the IDM running, the Hall effect sensor switches output states with each transition of the ring magnet (mounted on the fan shaft) from a north to a south pole orientation. These pulses are sent to the safety logic on the IGC board. By determining the number of pulses and the time needed for one revolution of the fan shaft, the IGC and Hall effect sensor can monitor the motor's speed in RPMs. If the fan is running above the minimum speed to induce a draft sufficient for proof of airflow, the safety logic will initiate the ignition sequence.

If the resultant flame is strong (flame rectification is proven), then the blower motor will be energized to distribute the heated air. This process continues as long as all conditions are satisfied by safety logic. The safety logic, in turn, monitors the Hall effect sensor's signal that indicates if the IDM is operating at or above minimum speed, ensuring a sufficient draft to the system.

For application assistance, current specifications, or name of the nearest Authorized Distributor, contact a nearby sales office. Or call:

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