



Introduction

The kitchen is said to be the most important room of a home, while cooking is the center and focal point when using the kitchen. The design of ranges, which includes the stove and cook top have improved with better cooking features and efficiencies. Electric ranges are the most popular while gas controlled ovens are also available.

Like many modern appliances, gas and electric ranges are usually equipped with microprocessor controls. A range uses a variety of sensors to ensure proper, safe, and energy-efficient operation and reliability.

Reed sensors and Hall Effect sensors are very reliable and will operate over millions of cycles with long-term integrity when used with microprocessor electrical loads. Both reed and Hall Effect devices are operated by a magnetic field. Reed switches and sensors consume no power, while Hall Effect devices are semiconductors and will consume a small amount of current in both the activated and de-activated state.

Oven Door Closure Sensor

The oven door latch serves two purposes for the signal sent to the controller unit. The first purpose is to sense that the door is closed. The second purpose of the switch is to send a signal to the controller that the LED light inside the oven is in the proper state.

The reed sensor may need to be rated at 150°C, since the sensor is fixed on the outer frame and can be exposed to high temperatures. In addition the magnet will also need an elevated temperature rating.

Littelfuse recommends the following products as door closure sensor and actuator because these are rated to 150°C and have proven to be durable in this application.

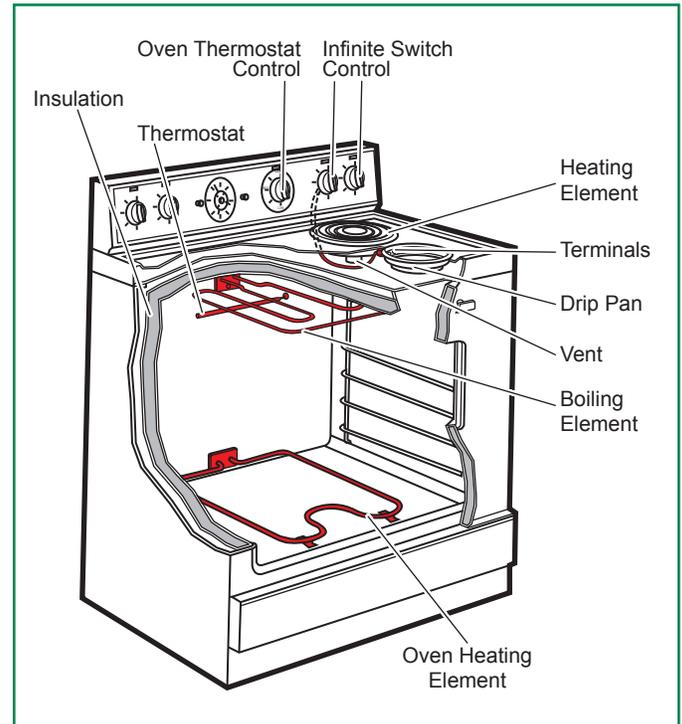


Figure 1: Components of a Stove and Oven Combo

Table 1: Suggested Products as Door Closure Sensor and Actuator

Suggested Products
59135 reed sensor with mating 57135 actuator
Custom-designed sensor and actuator



Figure 2: Door Closure Sensor Position

Door Lock Sensor

Range ovens that have the self-cleaning mode emit a very high temperature during the clean. The high temperature can cause hazardous situations, if the door is not properly closed. During the cleaning cycle, the door must be locked; otherwise the cleaning mode cannot occur.

In many cases, the same oven door closure sensor as mentioned above can also be used as the locking sensor for activating the solenoid for the cleaning mode. Again these sensors usually are required to be rated at 150°C.

Littelfuse recommends the following products as door lock sensor and actuator because these are rated to 150°C and have proven to be durable in this application.

Table 2: Suggested Products as Door Lock Sensor and Actuator

Suggested Products
59135 reed sensor with mating 57135 actuator
Custom-designed sensor and actuator

Gas Range Burner Control Knob

Many gas ovens are equipped with the popular control knob for controlling the burner temperature of the stove top and inside the oven. If a gas range is equipped with a micro-controller, then a closed-loop temperature control system could be in place for better temperature consistency.

With this controller, a non-contact solution would be preferred for improved long term reliability. A programmable rotary Hall Effect sensor is ideal for this application with 0.5V to 4.5Vdc output over 360 degrees of rotation.

The rotary Hall Effect is a semiconductor device that responds to a magnetic field. This device detects changes to the angle of the magnetic field or strength of the field as a magnet rotates over the sensor. This change in field during rotation is converted to an analog output voltage, or a pulse-width modulate (PWM) signal. The magnet is placed onto the control knob, while the sensor is placed on the fixed surface directly behind the magnet.



Figure 3: Burner Dial Control Using a Sensor

Littelfuse recommends the following Hall Effect sensors for this rotary function:

Table 3: Suggested Products for Rotary Function

Suggested Products
55300 rotary Hall Effect with mating magnet
Custom-designed rotary sensor

Exhaust Fan Speed Control Sensor

Most cook tops require a range hood to vent cooking smells, grease droplets, heat and steam, and gas cook tops also need to get rid of their combustion byproducts. An internal fan draws up air into a filter and that air is then either expelled outside (ducted) or returned to the kitchen as clean air (recirculation). This ensures your kitchen remains as clean, safe and fresh-smelling as possible.

The range hood contains a fan speed selector switch. This selector switch is a mechanical rotary device on many designs. As with the gas burner knob referenced previously, the same rotary Hall Effect sensor could be used to control the fan motor speed if the hood is equipped with a microcontroller.

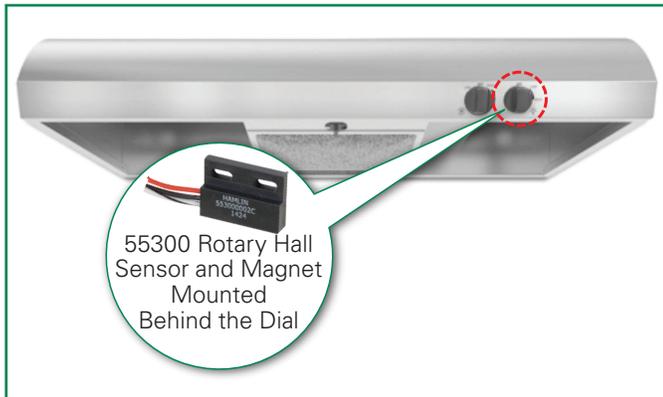


Figure 4: Fan Speed Control in a Range Hood

Littelfuse recommends the following products as exhaust fan speed control sensor:

Table 4: Suggested Products as Exhaust Fan Speed Control Sensor

Suggested Products
55300 rotary analog Hall sensor
Custom-designed rotary Hall sensor

FEATURES AND BENEFITS OF REED SWITCHES

- Switch activation does not require physical contact
- Switch contacts are within a hermetically sealed capsule
- Resistant to moisture, dust, and other foreign objects
- Wide operating temperature range
- Reliable switching
- Long lifetime

Why to Use Reed or Hall Sensor

A reed switch is a magnetically operated switch that in most situations are normally open when there is no magnetic field present. When a magnetic field is present in proper alignment and of sufficient strength, the contacts of the reed switch will close and complete the circuit.

Reed switches and Hall Effect sensors are magnetic switching devices, sometimes called 'contactless'; that is because the actuator/magnet does not make physical contact to the switch, to change the state, unlike a Micro-switch, or a Mechanical switch.

Reed switches are perfect technology for switching microprocessor electrical loads of 1-12Vdc and small milli-amps of current. Reed switches have precious metal contacts, hermetically sealed within a glass envelop and filled with nitrogen gas. The switching cycles can last up to many millions of operations with no degradation of contact wear, because of this inherent reed switch design.

A digital Hall Effect is a semiconductor with unlimited life when driven by the proper voltage and current. Reed and Hall Effect devices are long-lasting and very reliable within very humid and varying temperature applications.

FEATURES AND BENEFITS OF HALL EFFECT SENSORS

- No physical contact required to operate the sensor
- Wide operating temperature range
- Digital or analog options for output signal
- Programmable on both digital and analog applications for tight output tolerances
- Effective for high-speed applications
- Encapsulated sensors provide additional protection against mechanical stresses
- Long lifetime and reliable sensing for millions of operations

Beyond Sensing, Littelfuse Offers Circuit Protection Solutions

In addition to sensor products, Littelfuse offers the world's broadest and deepest portfolio of circuit protection and power control solutions.

Littelfuse recommends the following products for use in these applications:

Table 5: Circuit Protection and Power Control Solutions

Application Example	Product Series
Power Control	
Safety Latch Convection Fan Light Control	Q601Ex Triac
Heater Element	Q6040K7 Triac
Ignitior (Gas Range Oven)	K2400G SIDAC
Circuit Protection	
AC Mains	TMOV, LA, C-III MOV, UltraMOV Varistors
	3AG, 5x20mm Fuses
	Holders, Blocks, Clips
Control Board	TR5/TE5 Fuse
	SMD PTC
	P4KE/SMAJ TVS
Touch Screen/Display Panel	SP1001, SP1003, SP1006 Diode Arrays
	Multilayer Varistors

Littelfuse, Inc.
 8755 West Higgins Road, Suite 500
 Chicago, IL 60631 USA
 Phone: (773) 628-1000
www.littelfuse.com