



# Sensing Products Selection Guide



A guide to selecting the right sensing components for your applications



## About This Guide

This guide provides an overview of magnetic and temperature sensing technologies, key consideration factors, descriptions of technologies Littelfuse offers, and product selection tables. It is designed to help you quickly find a sensing solution appropriate to your application.

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# Build with Confidence Using Our Expanding and Customizable Portfolio Supported by Our Design Expertise

## Littelfuse: Everywhere, Every Day

Founded in 1927, Littelfuse has become the world's most respected circuit protection brand with well-established and growing platforms in power control and sensing technologies. Today, we are a global company, offering a diverse and extensive product portfolio—fuses, semiconductors, polymers, ceramics, relays, sensors, and more—serving the electronics, automotive, and industrial markets. Each is manufactured to exacting quality standards and backed by an unwavering commitment to technical support and customer service.

Our history of innovation, combined with our customer-first culture, drives us to collaborate with you to develop safer, more reliable products that are energy efficient and compliant with global regulations. We will partner with you to solve complex problems wherever electrical energy is used, bringing design, engineering, and technical expertise to deliver business results.

## Your Design Challenges, Solved

Our product designs are backed by experts committed to delivering the best solutions for your specific needs. Our global organization provides:

- Custom sensor designs per customer specifications
- Vertically integrated manufacturing
- In-house magnetic sensing simulation support
- Quick turnaround for custom sensor prototypes

### Customer Focus

A customer-first approach is at the heart of our company-wide culture, driving us to build long-lasting relationships and exceed expectations. Every day, it's our employees who make the difference for your business. They listen to your needs and understand your challenges. They use their knowledge and expertise to develop the best solutions and solve your problems.

### Application Expertise

At Littelfuse, we partner with customers to design, manufacture, and deliver innovative solutions for a wide range of markets including automotive and commercial vehicles, industrial applications, data and telecommunications, medical devices, consumer electronics, appliances, and transportation. Our expertise

involves applying reliable and efficient product solutions, innovative technologies, and global resources to address technical challenges in a variety of applications. Our worldwide network of research teams focuses on product development and support, design-in programs, and application testing in our global labs.

### Technology Innovation

Littelfuse offers a diverse magnetic and temperature sensor line. If we do not have a standard sensor that meets your needs, we will work with you to develop a forward-thinking solution that does. When you partner with us, you'll stay focused on making great products, not navigating the offerings of multiple vendors. The breadth and depth of our product portfolio ensure that the ideal solution for your application is readily available.

### Global Support

Through our network of global labs in China, Germany, Italy, Japan, Lithuania, Mexico, the Philippines, and the United States, we design innovative solutions and provide customer applications support and testing. Our unique capabilities include performance testing, material analysis, and regulatory compliance testing. The dedication of our global labs ensures the outstanding performance, safety, and reliability of our products and support services for our worldwide customer base.

With more than 12,000 employees in over 50 locations throughout the Americas, Europe, and Asia, Littelfuse products, applications knowledge, and technical support are available around the globe. Our network of regional customer support offices and hundreds of authorized distributors work to help you solve problems quickly.

### Operational Excellence

With our global manufacturing footprint, Littelfuse is firmly committed to manufacturing quality products at a competitive price. We build quality into our products and services, striving for zero defects in everything we do, thereby reducing cost and increasing your total satisfaction. We strive to exceed your expectations every day.

### Quality Assurance

Our global manufacturing facilities abide by strict quality assurance requirements and hold the following quality management system registrations:

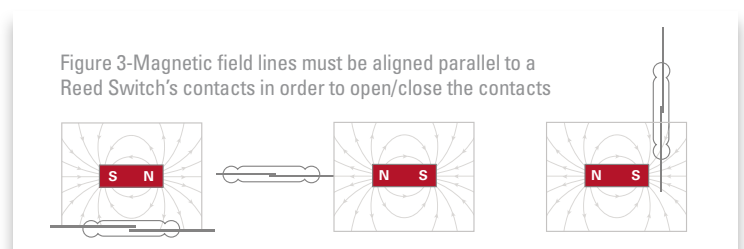
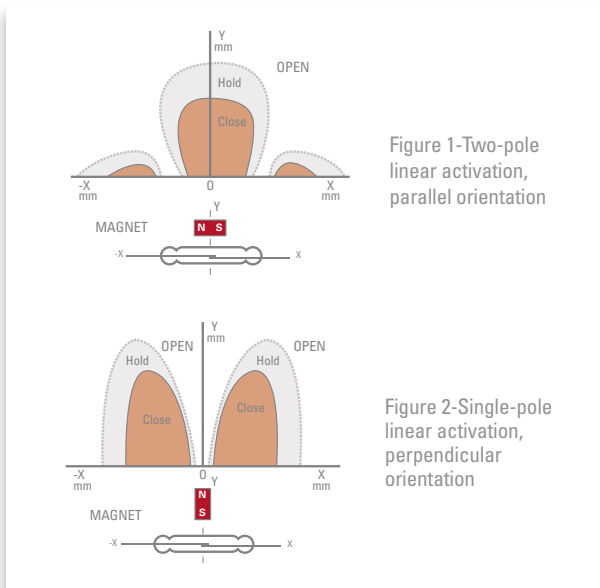
- ISO 9001
- ISO14001
- IATF 16949



Littelfuse is a global leader in providing magnetic sensing solutions. Our selection of Magnetic Sensors includes Reed Switches, Reed Sensors, Hall Effect Sensors, and Reed Relays, as well as bare and packaged Magnetic Actuators.

## Reed Switches

A Reed Switch has two ferromagnetic blades (reeds) contained within a tubular glass envelope that is hermetically sealed at each end. The contacts on each reed blade have a thin layer of precious metal material deposited on them. There is usually nitrogen gas on the inside of the glass envelope to eliminate the presence of oxygen and ensure that the contacts will not oxidize. Reed Switches are activated by a permanent magnet or an electromagnet. The Reed Switch and magnetic field combination is commonly known as the “magnetic circuit.”



## Reed Sensors

Reed Sensors are Reed Switches that are packaged within an external housing for simplified mounting/connecting and additional protection against environmental influences. These Sensors are typically mounted in mechanical systems. A bare Reed Switch can easily be mounted on circuit boards. However, for an application such as a door security sensor, the Reed Switch needs a protective shell/housing for handling and mounting. These packages offer resistance to mechanical stress by protecting the bare glass of the Reed Switch.

## Reed Relays

A Reed Relay is made by combining a Reed Switch with a copper coil. Like other relays, this provides galvanic isolation between the coil input and the controlled contact(s). However, because of the small size and magnetic efficiency of the Reed Switch, the power required to drive the coil is lower than most other types of relays. Other advantages include high insulation resistance, low contact resistance, and long contact life. Reed Relays are used in many applications including test equipment, security, medical, and process control equipment.

## Reed Technology Applications

Reed Switches are very popular for battery-powered applications. Because Reed Sensors can switch AC or DC loads, they are a popular choice for digital on/off applications, such as door closure detection for the security and household appliance markets.

The relative stiffness of the reed blades, along with the small gap and overlap between the two contacts, controls the sensitivity of the Reed Switch. The sensitivity of the switch is the amount of magnetic field that is required to actuate the contact into an open or closed mode. It is measured in units of ampere-turns (AT). Most Reed Switches have a sensitivity range of 10–30 AT, where 10 AT is more sensitive than 30 AT.

# Introduction to Magnetic Sensing

## Hall Effect Sensors

A Hall Effect device is a semiconductor-based integrated circuit with Hall plates that respond to magnetic fields. Additional circuitry is added for power supply, signal conditioning, temperature compensation, and EMC/ESD protection. Hall Effect devices provide digital or analog output signals that are used for proximity and continuous rotary or linear positioning. Unlike a Reed Switch, a Hall Effect Sensor contains active circuitry, so it always draws a small amount of current. Hall Effect devices come in two- or three-wire versions. Some devices are programmable.

## Hall Effect Technology Applications

Digital Hall Effect Sensors are very popular for high-speed sensing applications such as washing machines. Analog Hall Effect Sensors are used in detecting dial position in appliances and as Level Sensors for monitoring fluid levels in appliances such as dishwashers.

Parameter	Reed Switch	Hall Effect Sensor
No-contact sensing element	•	•
Current consumption	0	~20mA(Continuous) /6µA (Duty cycle)
Sensitivity (Gauss)	10+	42+
Maximum operating temperature	125	150
High-frequency operation	-	•
Digital switching	•	•
Linear sensing	-	•
Integrated circuitry	-	•
Electrical load capability	•	-
EMC/ESD Immunity	•	-
Ultra-small package size	-	•

**Comparing Reed Switch vs. Hall Effect.** Although there are differences between Reed Switch and Hall Effect technologies, both platforms offer practical advantages for various applications. Here is a comparison of the benefits of each technology.

## Magnetic Actuators

Littelfuse offers a wide range of Magnetic Actuators that are packaged in shapes similar to the relative mating sensors. We also offer a limited family of bare magnets with various grades of materials, including ferrite (ceramic), AlNiCo, and neodymium iron boron (NdFeB) materials.

## Customizable Options

- Modifications are available to existing standard product packages, such as adding connectors or changing wire size or length, as well as offering special Reed Switch sensitivities, custom lead forming, bending, and modifications to bare reed switches
- Fully new custom sensor package designs and/or circuitry
- Magnetic circuit (actuator magnet and sensor) design for a variety of applications

## Engineering Services

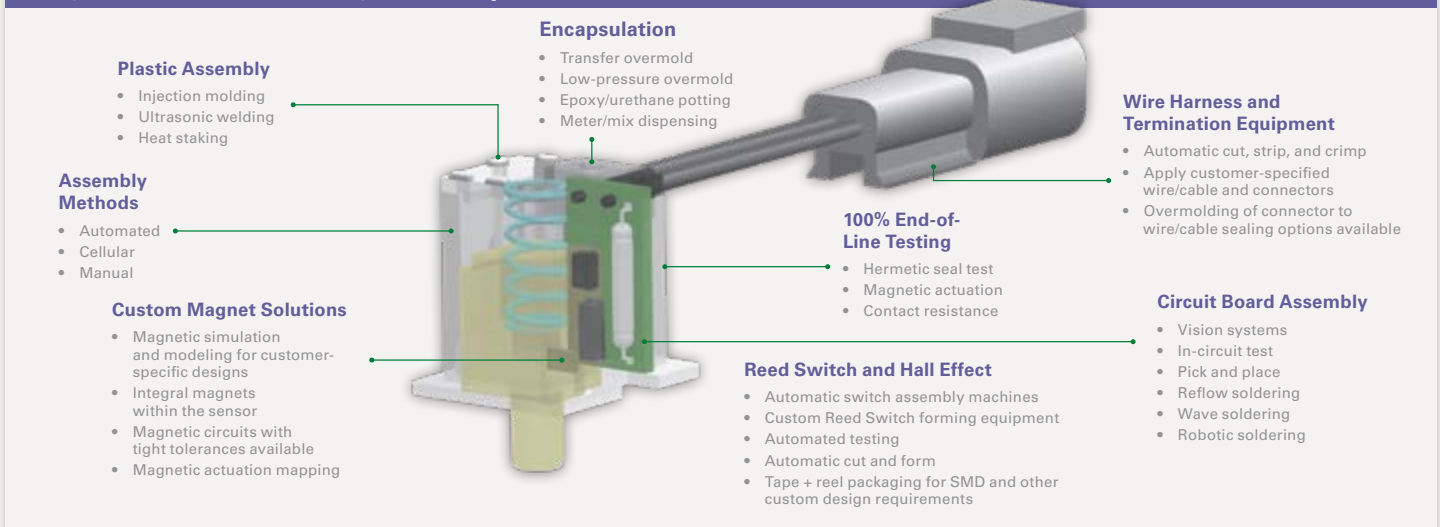
- 3D CAD mechanical design services
- Electronic circuitry design
- Magnetic simulation support analyzing feasibility of the design options
- 3D mapping of magnetic actuation of the sensor
- Rapid prototyping and quick-turn concept parts including 3D printed parts
- Prototype units using prototype tooling
- Reliability/validation testing options
- Fully designed, production-capable sensor and tooling

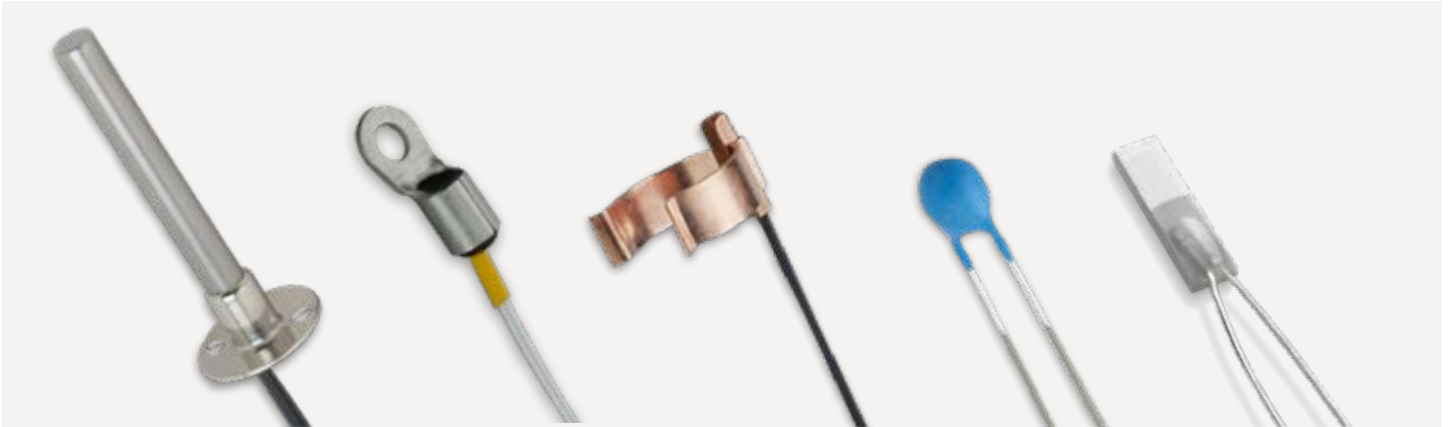
## Design Your Custom Magnetic Sensor

Littelfuse specializes in custom design packages that meet our customers' needs for both Reed Switch and Hall Effect Sensor designs. Our manufacturing processes are vertically integrated.

Littelfuse's dedicated application engineers are available to assist you in every step of the custom product development process. Contact our sensor application experts today at [littelfuse.com/sensorscontact](http://littelfuse.com/sensorscontact)

## Magnetic Sensor Manufacturing Process Capabilities





A Temperature Sensor is a device that detects and measures the average heat or thermal energy in a medium and converts it into an electrical signal. A wide variety of temperature sensing devices are available today. Littelfuse offers a broad range of Thermistors, Resistance Temperature Detectors (RTDs), Digital Temperature Indicators, and probes and assemblies for temperature sensing applications worldwide. Each has its own set of operating principles, features, benefits, considerations, and limitations for optimal use.

## Thermistors (NTCs and PTCs)

Thermistors are thermally sensitive resistors whose prime function is to exhibit a large, predictable, and precise change in electrical resistance when subjected to a corresponding change in body temperature. Negative Temperature Coefficient (NTC) thermistors exhibit a decrease in electrical resistance when subjected to an increase in body temperature. Positive Temperature Coefficient (PTC) thermistors exhibit an increase in electrical resistance when subjected to an increase in body temperature.

### Applications

Based on the predictable characteristics and their excellent long-term stability, Thermistors are generally accepted to be the most advantageous sensor for many applications including temperature measurement and control.

## RTDs

Platinum Resistance Temperature Detectors (Pt-RTDs) are temperature sensors that have a positive, predictable, and nearly linear change in resistance when subjected to a corresponding change in their body temperature.

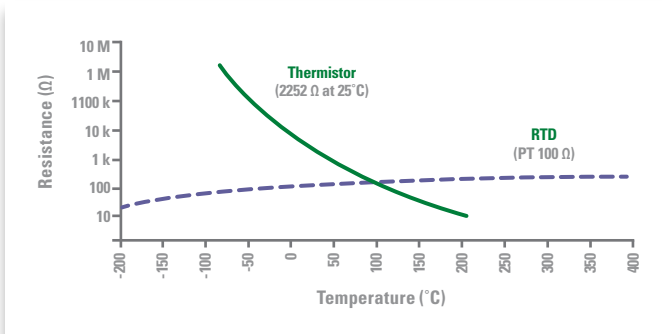
### Applications

The nearly linear output needed to precisely measure temperature over a very wide range makes RTDs ideal for digital measurement and control applications. Typical applications include industrial controls, medical electronics, HVAC-R, aerospace systems, white goods, small appliances, and food handling.

# Introduction to Temperature Sensing

NTC Thermistors	RTDs (Pt Thin Film)
Both are electrical resistors in which resistance changes with temperature Both require excitation current	
Metal oxide on ceramic substrate	Precious metal (typically Pt) on ceramic substrate
Very good accuracy suitable for most applications – most commonly used cost-effective temperature sensor	For more-specialized applications requiring very high accuracy (ex. 0.06%/0.15°C) For applications requiring a lot of precision
Exponential resistance-temperature curve	Nearly linear resistance-temperature curve provides ease and consistency of measurement
Wide operating temperature ranges from -50°C to 300°C	Extremely wide temperature ranges, specifically on the higher end, from -50°C to well above 500°C
Resistance values such as 100Ω, up to 5MΩ at 25°C	Resistance values such as 100Ω, 500Ω and 1000Ω at 0°C

**Comparing NTC Thermistors vs. RTDs.** Although both technologies sense temperature, they each exhibit different characteristics as shown in the comparison table above. Shown below is a comparison of the resistance-temperature behavior.



## Digital Temperature Indicators

Digital Temperature Indicators have a positive relationship between resistance and temperature. The response is very much like a digital signal; below the trip temperature, resistance will be low, above the trip temperature, resistance will be very high. This digital response is ideal for applications where knowing the temperature has increased beyond a specific value is required. With the digital response, no analog to digital conversion is necessary, allowing designers to save time and space.

### Applications

Typical applications include USB Type-C cables, power supplies, servers, and other similar systems where monitoring for a specific temperature is required.

## Customizable Options

Modifications are available to existing standard product packages, such as adding connectors or changing wire size or length, as well as offering special resistance-temperature (R-T) curves, R-T curve matching, and custom lead forming and bending to discrete thermistors. In addition, the following options and services are available.

- Complete custom sensor packages, including moisture-resistant designs
- Custom resistance-temperature (R-T) characteristics
- Specialized resistance tolerance or temperature accuracy within specified temperature ranges
- Sensing element design for best long-term stability
- Rapid prototyping and quick-turn concept parts including 3D printed parts
- Prototype units using prototype tooling
- Reliability/validation testing options
- Fully designed, production-capable sensor and tooling

## Quality and Reliability Testing

In addition to providing custom-designed products, we provide options to evaluate performance and long-term stability for the most demanding applications. Some of our testing capabilities include:

- Salt water immersion
- Freeze/thaw temperature cycling
- Thermal shock
- Sinusoidal vibration

## Design Your Custom Temperature Sensor

Littelfuse specializes in custom design packages that meet our customers' needs for both Thermistor and Resistance Temperature Detector (RTD) sensor designs.

If a standard sensor style doesn't meet your needs, contact us for further assistance at [littelfuse.com/sensorform](http://littelfuse.com/sensorform). Our application engineers are ready to help design the sensor you need.

# Applications



*We partner with customers to develop new solutions.*





# Electronic Sensor


## Application Matrix


Littelfuse Magnetic and Temperature Sensors are used in a wide variety of applications, from position sensing in doors to temperature sensing in electric vehicle battery packs. As applications evolve, we continue to partner with customers to develop new solutions, including customizations to cater to their needs. The following application matrix will help you visualize where Littelfuse can solve design challenges for your specific project.

Vertical Markets	Applications	Temperature Sensing			Magnetic Sensing	
		NTC Thermistors <sup>(1)</sup>	RTDs <sup>(2)</sup>	Digital Temperature Indicators	Reed Switches	Hall Effect Sensors
Automotive and Transportation	Temperature sensing EV battery packs	●	●	-	-	-
	Detect seat belt buckle engagement	-	-	-	-	●
	Position sensing-door/window/kickstand (2- wheeler)	-	-	-	-	-
	Diesel exhaust fluid (AdBlue <sup>™(3)</sup> ) level measurement	-	-	-	-	-
	Hydraulic arm position sensing	-	-	-	-	-
EV Infrastructure	Position detection of access doors and panels for security	-	-	-	●	●
	Temperature sensing and fan speed control	●	-	-	-	-
	Temperature sensing for power converter heat sink	●	-	-	●	●
Datacenter	Analog temperature sensing	●	-	-	-	-
	MCU cooling fan on/off controls	-	-	●	●	-
	MCU cooling fan speed controls	●	-	-	●	-
	Position sensing for racks-door/safety/access interlocks	-	-	-	●	-
	Temperature sensing and fan speed control	●	-	●	●	-
	Position sensing for module activation and safety interlocks	-	-	-	●	-
Consumer and Mobile Electronics	Paper tray position detection	-	-	-	●	-
	Charging cradle detection	-	-	-	●	-
	Lens rotation detection	-	-	-	●	-
	Battery pack temperature monitoring	●	-	●	-	-
	USB-C connector overheating detection	-	-	●	-	-
	Power supply temperature indication	-	-	●	-	-
Appliances	Open/closed sensing for doors	-	-	-	●	●
	Position of compartments and drawers	-	-	-	●	●
	General fluid level sensing (e.g., water, detergent)	-	-	-	●	●
	Temperature-sensing air/liquids/refrigerants	●	●	-	-	-
	Battery pack temperature monitoring	●	-	●	-	-
	Motor or power semiconductor temperature monitoring	●	-	●	-	-
	General safety and functional interlocks	-	-	-	●	●
Industrial	Temperature measurement and general process controls	●	●	-	-	-
	Position and speed sensing on robotic arms	-	-	-	●	●
	Temperature sensing to monitor semiconductor performance	●	-	●	-	-
	Fan/cooling system speed controls	●	-	-	-	-
	Fan/cooling system activation controls	-	-	●	-	-
	Level sensing for fluid flow	●	●	-	●	●
Building Automation	HVAC <sup>(4)</sup> and water heating systems temperature controls	●	●	-	-	-
	Building temperature controls	●	-	-	-	-
	Smart meter anti-tamper detection	-	-	-	●	-
	Smart meter gas and water flow measurement	-	-	-	●	-
	General fluid flow measurement	-	-	-	●	●
	Access control IoT systems	-	-	-	●	-
	Door and window position detection	-	-	-	●	●
	Temperature detection in fire and safety systems	●	-	-	-	-

**Notes:** (1) NTC – Negative Temperature Coefficient (2) RTD – Resistance Temperature Detectors (3) AdBlue (AUS 32) is a registered trademark of the German Association of the Automotive Industry (VDA) (4) HVAC – Heating, ventilation, and air conditioning

# Reed Switches

Leads												
Product Series	Switch Type	Package	Body Length mm (inch)	Lead-Lead Length mm (inch)	Switching Power (W)	Switching Voltage (V)	Breakdown Voltage** (Vdc - min.)	Switching Current (A)	Contact Resistance (Ω)	Operating Temperature (°C)	Magnetic Sensitivity (AT)	
<a href="#">MITI-7</a>	A: SPST-NO	Glass	7.00 (.276)	40.38 (1.590)	10	170 Vdc, 120 Vac	175	0.25 Adc, 0.18 Aac	0.15	-40 to +125	6-20	•
<a href="#">MDSR-10</a>	A: SPST-NO	Glass	10.16 (.400)	40.38 (1.590)	10	200 Vdc, 140 Vac	250	0.5 Adc, 0.35 Aac	0.12	-40 to +125	10-25	•
<a href="#">MDSR-7</a>	A: SPST-NO	Glass	12.70 (.500)	40.38 (1.590)	10	200 Vdc, 140 Vac	250	0.5 Adc, 0.35 Aac	0.1	-40 to +125	10-25	•
<a href="#">FLEX-14</a>	A: SPST-NO	Glass	14.00 (.551)	44.30 (1.744)	10	200 Vdc, 140 Vac	250	0.5 Adc, 0.35 Aac	0.1	-40 to +125	10-30	•
<a href="#">MDCG-4</a>	A: SPST-NO	Glass	15.24 (.600)	40.38 (1.590)	10	200 Vdc, 140 Vac	250	0.5 Adc, 0.35 Aac	0.1	-40 to +125	12-38	•
<a href="#">MACD-14</a>	A: SPST-NO	Glass	14.00 (.551)	44.30 (1.744)	10	200 Vdc, 140 Vac	200	0.5 Adc, 0.35 Aac	0.1	-40 to +125	10-30	•
<a href="#">MDRR-DT</a>	C: SPDT-CO	Glass	14.73 (.580)	51.66 (2.034)	5	175 Vdc, 120 Vac	200	0.25 Adc, 0.18 Aac	0.1	-40 to +125	15-30	•
<a href="#">59045-1</a>	A: SPST-NO	Overmolded	17.78 (.700)	15.24 (.600)	10	200 Vdc, 140 Vac	250	0.5 Adc, 0.35 Aac	0.2	-40 to +105	15-30	•
<a href="#">59050-1</a>	A: SPST-NO	Overmolded	22.86 (.900)	20.32 (.800)	10	200 Vdc, 140 Vac	250	0.5 Adc, 0.35 Aac	0.2	-40 to +105	12-33	•
<a href="#">HA15-2</a>	A: SPST-NO	Glass	15.24 (.600)	40.38 (1.590)	20 <sup>1</sup>	200 Vdc, 265 Vac	400 450	0.4 Adc, 0.3 Aac 0.5 Adc, 0.35 Aac	0.1	-20 to +125	17-23 22-33	•
<a href="#">MLRR-4</a>	A: SPST-NO	Glass	15.24 (.600)	40.38 (1.590)	20	200 Vdc, 140 Vac	250	1.0 Adc, 0.7 Aac	0.1	-40 to +125	17-38	•
<a href="#">MLRR-3</a>	A: SPST-NO	Glass	15.24 (.600)	56.64 (2.230)	20	200 Vdc, 140 Vac	250	1.0 Adc, 0.7 Aac	0.1	-40 to +125	17-38	•
<a href="#">MVSR-20</a>	A: SPST-NO	Glass	19.69 (0.775)	56.77 (2.235)	10	1000 Vdc	2000	0.5 Adc, 0.35 Aac	0.1	-75 to +125	17-38	•
<a href="#">59050-2</a>	A: SPST-NO	Overmolded	22.86 (.900)	20.32 (.800)	20	200 Vdc, 265 Vac	400	0.5 Adc, 0.35 Aac	0.2	-20 to +105	17-33	•
<a href="#">MRPR-20</a>	A: SPST-NO	Glass	20.32 (.800)	56.64 (2.230)	50	250 Vdc, 265 Vac	750	1.5 Adc, 1.1 Aac	0.1	-20 to +125	17-43	•
<a href="#">DRS-50</a>	A: SPST-NO	Glass	50.80 (2.000)	82.55 (3.250)	100	280 Vac, 400 Vdc	600	3.0 Adc, 2.1 Aac	0.1	-40 to +125	42-83	•
<a href="#">DRS-DTH</a>	C: SPDT-CO	Glass	39.67 (1.562)	85.73 (3.375)	30	350 Vac, 500 Vdc	1200	0.50 Adc, 0.35 Aac	0.125	-20 to +125	50-80	•

Surface Mount												
Product Series	Switch Type	Package	Body Length mm (inch)	Lead-Lead Length mm (inch)	Switching Power (W)	Switching Voltage (V)	Breakdown Voltage** (Vdc - min.)	Switching Current (A)	Contact Resistance (Ω)	Operating Temperature (°C)	Magnetic Sensitivity (AT)	
<a href="#">MISM-7</a>	A: SPST-NO	Glass	7.00 (.276)	13.72 (.540)	10	170 Vdc, 120 Vac	175	0.25 Adc, 0.18 Aac	0.15	-40 to +125	6-20	•
<a href="#">MDSM-10</a>	A: SPST-NO	Glass	10.16 (.400)	15.62 (.615)	10	200 Vdc, 140 Vac	250	0.5 Adc, 0.35 Aac	0.12	-40 to +125	10-25	•
<a href="#">MDSM-4</a>	A: SPST-NO	Glass	15.24 (.600)	19.30 (.760)	10	200 Vdc, 140 Vac	250	0.5 Adc, 0.35 Aac	0.1	-40 to +125	12-38	•
<a href="#">MASM-14</a>	A: SPST-NO	Glass	14.00 (.551)	44.30 (1.744)	10	200 Vdc, 140 Vac	200	0.5 Adc, 0.35 Aac	0.1	-40 to +125	10-30	•
<a href="#">MDSM-DT</a>	C: SPDT-CO	Glass	14.73 (.580)	25.40 (1.000)	5	175 Vdc, 120 Vac	200	0.25 Adc, 0.18 Aac	0.1	-40 to +125	15-30	•
<a href="#">MLSM-4</a>	A: SPST-NO	Glass	15.24 (.600)	19.56 (.770)	20	200 Vdc, 140 Vac	250	1.0 Adc, 0.7 Aac	0.1	-40 to +125	17-38	•
<a href="#">MLSM-3</a>	A: SPST-NO	Glass	15.24 (.600)	19.56 (.770)	20	200 Vdc, 140 Vac	250	1.0 Adc, 0.7 Aac	0.1	-40 to +125	17-38	•



For details on electrical specifications, visit [littelfuse.com](http://littelfuse.com).

A: SPST-NO = Single Pole Single Throw – Normally Open.  
C: SPDT-CO = Single Pole Double Throw – Change Over.  
NO = Normally Open.

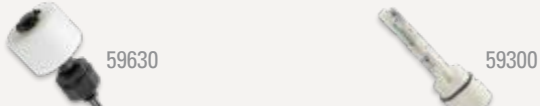
All Reed Switches are RoHS compliant.  
Certification: Contact Littelfuse for certified ratings.


\*\*Breakdown Voltage – per MIL-STD-202, Method 301. '20 W for 100-265 VAC loads, 10 W for all other loads.

## Reed Switches (Continued)

Overmolded												
												
Product Series	Switch Type	Package	Body Length mm (inch)	Lead-Lead Length mm (inch)	Switching Power (W)	Switching Voltage (V)	Breakdown Voltage** (Vdc - min.)	Switching Current (A)	Contact Resistance (Ω)	Operating Temperature (°C)	Magnetic Sensitivity (AT)	
<a href="#">59165</a>	A: SPST-NO	Overmolded	16.00 (.630)	20.20 (.795)	10	200 Vdc, 140 Vac	250	0.5 Adc, 0.35 Aac	0.1	-40 to +125	10-25	•
<a href="#">59166</a>	A: SPST-NO	Overmolded	16.00 (.630)	19.51 (.768)	10	200 Vdc, 140 Vac	250	0.5 Adc, 0.35 Aac	0.1	-40 to +125	10-26	•
<a href="#">59170</a>	A: SPST-NO	Overmolded	11.43 (.450)	16.25 (.640)	10	200 Vdc, 140 Vac	250	0.5 Adc, 0.35 Aac	0.15	-40 to +125	10-25	•

## Reed Sensors

Float								
								
Product Series	Description	Overall Dimensions		Contact Rating	Switching Voltage	Breakdown Voltage	Switching Current	Contact Resistance, Initial
		mm (inch)		W	Vdc	Vdc	A	Ohms
		Ø × L		Max.	Max.	Min.	Max.	Max.
<a href="#">59630</a>	Float Sensor, Normally Open	23.70 (0.930) × 43.70 (1.720)		10	200	250	0.5	0.2
	Float Sensor, Normally Open High Voltage	23.70 (0.930) × 43.70 (1.720)		10	300	450	0.5	0.2
	Float Sensor, Changeover	23.70 (0.930) × 43.70 (1.720)		5	175	200	0.25	0.2
	Float Sensor, Normally Closed	23.70 (0.930) × 43.70 (1.720)		10	200	250	0.5	0.2
<a href="#">59300</a>	Level Sensor, Normally Open (Float Not Included)	19.90 (0.783) × 67.55 (2.660)		10	200	250	0.5	0.2

Vane								
								
Product Series	Description	Overall Dimensions		Contact Rating	Switching Voltage	Breakdown Voltage	Switching Current	Contact Resistance, Initial
		mm (inch)		W	Vdc	Vdc	A	Ohms
		L × W × H		Max.	Max.	Min.	Max.	Max.
<a href="#">59085</a>	Vane Sensor, Normally Open	25.40 (1.000) × 19.05 (0.750) × 6.35 (0.250)		5	175	200	0.25	0.2
	Vane Sensor, Changeover	25.40 (1.000) × 19.05 (0.750) × 6.35 (0.250)		5	175	200	0.25	0.2
	Vane Sensor, Normally Closed	25.40 (1.000) × 19.05 (0.750) × 6.35 (0.250)		10	200	250	0.5	0.2
	Vane Sensor, Normally Closed High Voltage	25.40 (1.000) × 19.05 (0.750) × 6.35 (0.250)		10	300	450	0.5	0.2
<a href="#">59086</a>	Vane Sensor, Normally Open	25.40 (1.000) × 19.05 (0.750) × 6.35 (0.250)		5	175	200	0.25	0.2
	Vane Sensor, Changeover	25.40 (1.000) × 19.05 (0.750) × 6.35 (0.250)		5	175	200	0.25	0.2
	Vane Sensor, Normally Closed	25.40 (1.000) × 19.05 (0.750) × 6.35 (0.250)		10	200	250	0.5	0.2
	Vane Sensor, Normally Closed High Voltage	25.40 (1.000) × 19.05 (0.750) × 6.35 (0.250)		10	300	450	0.5	0.2
<a href="#">59090</a>	Heavy Duty Vane Sensor, Normally Closed	32.50 (1.280) × 32.25 (1.271) × 23.25 (0.915)		10	200	250	0.5	0.2
	Heavy Duty Vane Sensor, Normally Closed High Voltage	32.50 (1.280) × 32.25 (1.271) × 23.25 (0.915)		10	300	450	0.5	0.2
	Heavy Duty Vane Sensor, Changeover	32.50 (1.280) × 32.25 (1.271) × 23.25 (0.915)		5	175	200	0.25	0.2

For details on electrical specifications, visit [littelfuse.com](http://littelfuse.com).

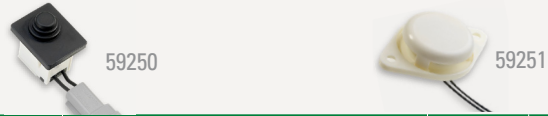
A:SPST-NO = Single Pole Single Throw – Normally Open.  
C:SPDT-CO = Single Pole Double Throw – Change Over.  
NO = Normally Open.

All Reed Switches are RoHS compliant.  
Certification: Contact Littelfuse for certified ratings.

\*\*Breakdown Voltage – per MIL-STD-202, Method 301. †20 W for 100-265 VAC loads, 10 W for all other loads.

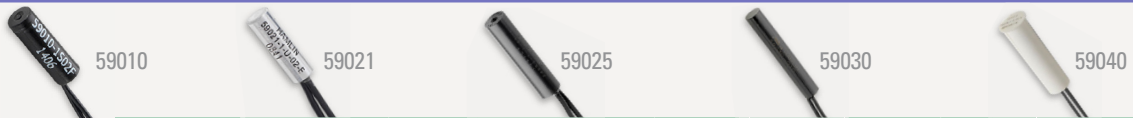
## Reed Sensors (Continued)

### Seat Occupancy



Product Series	Description	Overall Dimensions	Contact Rating	Switching Voltage	Breakdown Voltage	Switching Current	Contact Resistance, Initial
		mm (inch)	W	Vdc	Vdc	A	Ohms
		L × W × H	Max.	Max.	Min.	Max.	Max.
<a href="#">59250</a>	Push-button Seat Sensor (Reed)	32.51 (1.280) × 26.67 (1.050) × 37.34 (1.470)	10	200	250	0.5	0.2
<a href="#">59251</a>	Seat Sensor with Dome (Reed)	108.20 (4.260) × 69.85 (2.750) × 39.88 (1.570)	10	200	250	0.5	0.2

### Cylindrical Sensor

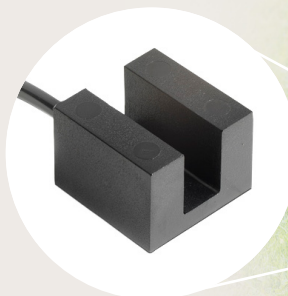


Product Series	Description	Overall Dimensions	Contact Rating	Switching Voltage	Breakdown Voltage	Switching Current	Contact Resistance, Initial	Mating Actuator
		mm (inch)	W	Vdc	Vdc	A	Ohms	
		Ø × L	Max.	Max.	Min.	Max.	Max.	
<a href="#">59010</a>	Ultra-Mini Cylindrical	3.13 (0.123) × 9.00 (0.354)	5	170	175	0.25	0.25	57020
<a href="#">59020</a>	Mini Cylindrical	5.10 (0.201) × 15.24 (0.600)	10	170	175	0.25	0.25	57020
<a href="#">59021</a>	Aluminum Mini Cylindrical	5.10 (0.201) × 15.24 (0.600)	10	170	175	0.25	0.25	57020
<a href="#">59022</a>	Cylindrical, Normally Open	5.80 (.228) × 25.4 (1.000)	10	200	250	0.5	0.2	57022
	Cylindrical, Changeover	5.80 (.228) × 25.4 (1.000)	5	175	200	0.25	0.2	
	Cylindrical, Normally Closed	5.80 (.228) × 25.4 (1.000)	5	175	200	0.25	0.2	
<a href="#">59025</a>	Cylindrical, Normally Open	6.22 (0.245) × 25.40 (1.000)	10	200	250	0.5	0.2	57025
	Cylindrical, Normally Open High Voltage	6.22 (0.245) × 25.40 (1.000)	10	300	450	0.5	0.2	
	Cylindrical, Changeover	6.22 (0.245) × 25.40 (1.000)	5	175	200	0.25	0.2	
<a href="#">59030</a>	Cylindrical, Normally Open	6.22 (0.245) × 38.10 (1.500)	10	200	250	0.5	0.2	57030
	Cylindrical, Normally Open High Voltage	6.22 (0.245) × 38.10 (1.500)	10	300	450	0.5	0.2	
	Cylindrical, Changeover	6.22 (0.245) × 38.10 (1.500)	5	175	200	0.25	0.2	
<a href="#">59040</a>	Cylindrical, Normally Closed	6.22 (0.245) × 38.10 (1.500)	5	175	200	0.25	0.2	57040
	Press-Fit Cylindrical, Normally Open	9.5 (0.375) Hole Ø × 31.00 (1.220)	10	200	250	0.5	0.2	
	Press-Fit Cylindrical, Changeover	9.5 (0.375) Hole Ø × 31.00 (1.220)	5	175	200	0.25	0.2	
	Press-Fit Cylindrical, Normally Closed	9.5 (0.375) Hole Ø × 31.00 (1.220)	5	175	200	0.25	0.2	

## How is the Sensor Used Here?


### 59090 Reed Sensor

Our Reed Vane Sensor 59090 senses when the grass bag is in the proper position on the electric powered lawn mower. If not sensed, the mower will not activate.



## Reed Sensors (Continued)

Threaded Barrel									
									
Product Series	Description	Overall Dimensions		Contact Rating	Switching Voltage	Breakdown Voltage	Switching Current	Contact Resistance, Initial	Mating Actuator
		mm (inch)		W	Vdc	Vdc	A	Ohms	
		Thread Pitch × L		Max.	Max.	Min.	Max.	Max.	
59060	Stainless Steel Threaded Barrel Sensor, Normally Open	M8 × 1.25 Pitch × 36.00 (1.420)		10	200	250	0.5	0.2	57060
	Stainless Steel Threaded Barrel Sensor, Normally Open High Voltage	M8 × 1.25 Pitch × 36.00 (1.420)		10	300	450	0.5	0.2	
	Stainless Steel Threaded Barrel Sensor, Changeover	M8 × 1.25 Pitch × 36.00 (1.420)		5	175	200	0.25	0.2	
	Stainless Steel Threaded Barrel Sensor, Normally Closed	M8 × 1.25 Pitch × 36.00 (1.420)		5	175	200	0.25	0.2	
59065	Threaded Barrel Sensor (Standard), Normally Open	(5/16 × 24) Pitch × 38.10 (1.500)		10	200	250	0.5	0.2	57065
	Threaded Barrel Sensor (Standard), Normally Open High Voltage	(5/16 × 24) Pitch × 38.10 (1.500)		10	300	450	0.5	0.2	
	Threaded Barrel Sensor (Standard), Changeover	(5/16 × 24) Pitch × 38.10 (1.500)		5	175	200	0.25	0.2	
	Threaded Barrel Sensor (Standard), Normally Closed	(5/16 × 24) Pitch × 38.10 (1.500)		5	175	200	0.25	0.2	
59070	Threaded Barrel Sensor (Metric), Normally Open	M8 × 1.25mm Pitch × 38.10 (1.500)		10	200	250	0.5	0.2	57070
	Threaded Barrel Sensor (Metric), Normally Open High Voltage	M8 × 1.25mm Pitch × 38.10 (1.500)		10	300	450	0.5	0.2	
	Threaded Barrel Sensor (Metric), Changeover	M8 × 1.25mm Pitch × 38.10 (1.500)		5	175	200	0.25	0.2	
	Threaded Barrel Sensor (Metric), Normally Closed	M8 × 1.25mm Pitch × 38.10 (1.500)		5	175	200	0.25	0.2	
59075	Heavy Duty Threaded Barrel, Normally Open	M12 × 1mm Pitch × 46.00 (1.810)		10	200	250	0.5	0.2	57075
	Heavy Duty Threaded Barrel, Normally Open High Voltage	M12 × 1mm Pitch × 46.00 (1.810)		10	300	450	0.5	0.2	
	Heavy Duty Threaded Barrel, Changeover	M12 × 1mm Pitch × 46.00 (1.810)		5	175	200	0.25	0.2	
	Heavy Duty Threaded Barrel, Normally Closed	M12 × 1mm Pitch × 46.00 (1.810)		5	175	200	0.25	0.2	

Lever Arm								
								
Product Series	Description	Overall Dimensions		Contact Rating	Switching Voltage	Breakdown Voltage	Switching Current	Contact Resistance, Initial
		mm (inch)		W	Vdc	Vdc	A	Ohms
		L × W × H		Max.	Max.	Min.	Max.	Max.
59210	Lever Arm Sensor	24 (0.945) × 23 (0.906) × 10 (0.394)		10	200	250	0.5	0.2

## How is the Sensor Used Here?

### 59145 Reed Sensor

There are four magnets on the dust filter and one Sensor on the vacuum cleaner. If the dust filter is assembled, the Sensor will be actuated by the magnet, and the vacuum cleaner is ready to be used.



## Reed Sensors (Continued)

Flange/Flat Pack								
								
Product Series	Description	Overall Dimensions	Contact Rating	Switching Voltage	Breakdown Voltage	Switching Current	Contact Resistance, Initial	Mating Actuator
		mm (inch)	W	Vdc	Vdc	A	Ohms	
		L × W × H	Max.	Max.	Min.	Max.	Max.	
59105	Terminal Flange Mount Sensor, Normally Open	40.17 (1.582) × 19.05 (0.750) × 6.60 (0.260)	10	200	250	0.5	0.2	57105
	Terminal Flange Mount Sensor, Normally Open High Voltage	40.17 (1.582) × 19.05 (0.750) × 6.60 (0.260)	10	300	450	0.5	0.2	
	Terminal Flange Mount Sensor, Normally Closed	40.17 (1.582) × 19.05 (0.750) × 6.60 (0.260)	5	175	200	0.25	0.2	
59125	Pinned Flange Mount Sensor, Normally Open	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)	10	200	250	0.5	0.2	57125
	Pinned Flange Mount Sensor, Normally Open High Voltage	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)	10	300	450	0.5	0.2	
	Pinned Flange Mount Sensor, Normally Closed	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)	5	175	200	0.25	0.2	
59135	High-Temp Flange Mount Sensor, Normally Open	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)	10	200	250	0.5	0.2	57135
	High-Temp Flange Mount Sensor, Normally Open High Voltage	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)	10	300	450	0.5	0.2	
	High-Temp Flange Mount Sensor, Changeover	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)	5	175	200	0.25	0.2	
	High-Temp Flange Mount Sensor, Normally Closed	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)	5	175	200	0.25	0.2	
59140	Mini Flange Mount Sensor, Normally Open	23.0 (0.906) × 14.00 (0.551) × 6.00 (0.236)	10	200	250	0.5	0.2	57140
	Mini Flange Mount Sensor, Normally Open High Voltage	23.0 (0.906) × 14.00 (0.551) × 6.00 (0.236)	10	300	450	0.5	0.2	
	Mini Flange Mount Sensor, Changeover	23.0 (0.906) × 14.00 (0.551) × 6.00 (0.236)	5	175	200	0.25	0.2	
	Mini Flange Mount Sensor, Normally Closed	23.0 (0.906) × 14.00 (0.551) × 6.00 (0.236)	5	175	200	0.25	0.2	
59141	Mini Flange Mount Sensor, Normally Open	23.0 (0.906) × 14.00 (0.551) × 6.00 (0.236)	10	200	250	0.5	0.2	57140
	Mini Flange Mount Sensor, Normally Open High Voltage	23.0 (0.906) × 14.00 (0.551) × 6.00 (0.236)	10	300	450	0.5	0.2	
	Mini Flange Mount Sensor, Changeover	23.0 (0.906) × 14.00 (0.551) × 6.00 (0.236)	5	175	200	0.25	0.2	
	Mini Flange Mount Sensor, Normally Closed	23.0 (0.906) × 14.00 (0.551) × 6.00 (0.236)	5	175	200	0.25	0.2	
59145	Flange Mount Sensor, Normally Open	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)	10	200	250	0.5	0.2	57145
	Flange Mount Sensor, Normally Open High Voltage	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)	10	300	450	0.5	0.2	
	Flange Mount Sensor, Changeover	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)	5	175	200	0.25	0.2	
	Flange Mount Sensor, Normally Closed	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)	5	175	200	0.25	0.2	
59150	Flange Mount Sensor, Normally Open	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)	10	200	250	0.5	0.2	57150
	Flange Mount Sensor, Normally Open High Voltage	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)	10	300	450	0.5	0.2	
	Flange Mount Sensor, Changeover	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)	5	175	200	0.25	0.2	
	Flange Mount Sensor, Normally Closed	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)	5	175	200	0.25	0.2	

For details on electrical specifications, visit [littelfuse.com](http://littelfuse.com).

# Reed Relays

## Single-in-Line (SIL)



Product Series	Description	Overall Dimensions		Coil Voltage		Coil Resistance	Contact Ratings, Switching			Contact Form
		Transfer Molded Body	External Shield Body	Vdc	Vdc	Ohms	Vdc	A	W	
		mm (inch)	mm (inch)							
		L x W x H	L x W x H	Nominal	Max.	Nominal	Max.	Max.		
<a href="#">HE3321A0400</a>	Reed Relay, SIL, SPST-NO	24.13 (0.950) x 7.00 (0.276) x 7.40 (0.291)	24.90 (0.980) x 7.60 (0.299) x 7.80 (0.307)	5	22	500	200	0.5	10	Form A
<a href="#">HE3321A1200</a>				12	22	500				
<a href="#">HE3321A2400</a>				24	44	2000				
<a href="#">HE3321C0500</a>	Reed Relay, SIL, SPDT-CO	24.13 (0.950) x 7.00 (0.276) x 7.40 (0.291)	24.90 (0.980) x 7.60 (0.299) x 7.80 (0.307)	5	11	125	175	0.25	5	Form C
<a href="#">HE3321C1200</a>				12	22	500				
<a href="#">HE3321C2400</a>				24	44	2000				
<a href="#">HE3351A0500</a>	Reed Relay, SIL, SPST-NO, High Voltage	24.13 (0.950) x 7.00 (0.276) x 7.40 (0.291)	24.90 (0.980) x 7.60 (0.299) x 7.80 (0.307)	5	14	125	300	0.5	10	Form A
<a href="#">HE3351A1200</a>				12	22	500				
<a href="#">HE3351A2400</a>				24	44	2000				

## Miniature Single-in-Line (SIL)



Product Series	Description	Overall Dimensions		Coil Voltage		Coil Resistance	Contact Ratings, Switching			Contact Form
		Transfer Molded Body	External Shield Body	Vdc	Vdc	Ohms	Vdc	A	W	
		mm (inch)	mm (inch)							
		L x W x H	L x W x H	Nominal	Max.	Nominal	Max.	Max.		
<a href="#">HE3621A0500</a>	Reed Relay, SIL, SPST-NO	19.05 (0.750) x 5.08 (0.200) x 7.45 (0.293)	19.70 (0.776) x 5.65 (0.222) x 7.87 (0.310)	5	14	500	200	0.5	10	Form A
<a href="#">HE3621A1200</a>				12	22	1000				
<a href="#">HE3621A2400</a>				24	31	2150				

## How is the Sensor Used Here?

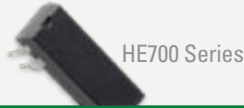
### 59141 Reed Sensor

There are two Sensors in the coffee machine: one is to detect if the coffee machine top lid is open or closed; the other one does the same for the rotating door.



## Reed Relays (Continued)

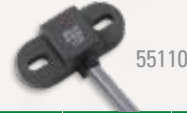
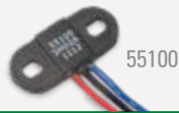
Dual-in-Line (DIL)



Product Series	Description	Overall Dimensions		Coil Voltage		Coil Resistance	Contact Ratings, Switching			Contact Form
		Transfer Molded Body	External Shield Body	Vdc	Vdc	Ohms	Vdc	A	W	
		mm (inch)	mm (inch)							
		L × W × H	L × W × H	Nominal	Max.	Nominal	Max.	Max.	Max.	
<a href="#">HE721A0500</a>	Reed Relay, DIL, SPST-NO	19.05 (.750) × 7.22 (0.284) × 5.50 (0.217)	20.14 (0.793) × 7.62 (0.300) × 5.82 (0.229)	5	12	500	200	0.5	10	Form A
<a href="#">HE721A1200</a>				12	31	1000				
<a href="#">HE721A2400</a>				24	46	2150				
<a href="#">HE721B0500</a>	Reed Relay, DIL, SPST-NC	19.05 (.750) × 7.22 (0.284) × 5.50 (0.217)	20.14 (0.793) × 7.62 (0.300) × 5.82 (0.229)	5	6.5	500	200	0.5	10	Form B
<a href="#">HE721B1200</a>				12	14	500				
<a href="#">HE721B2400</a>				24	28	2150				
<a href="#">HE721C0500</a>	Reed Relay, DIL, SPDT-CO	19.05 (.750) × 7.22 (0.284) × 5.50 (0.217)	20.14 (0.793) × 7.62 (0.300) × 5.82 (0.229)	5	14	200	175	0.25	5	Form C
<a href="#">HE721C1200</a>				12	22	500				
<a href="#">HE721C2400</a>				24	44	2000				
<a href="#">HE721E0500</a>	Reed Relay, DIL, SPDT-CO	19.05 (.750) × 7.22 (0.284) × 5.50 (0.217)	20.14 (0.793) × 7.62 (0.300) × 5.82 (0.229)	5	14	200	175	0.25	5	Form C
<a href="#">HE721E1200</a>				12	22	500				
<a href="#">HE721E2400</a>				24	44	2000				
<a href="#">HE721R0500</a>	Reed Relay, DIL, SPDT-CO	19.05 (.750) × 7.22 (0.284) × 5.50 (0.217)	20.14 (0.793) × 7.62 (0.300) × 5.82 (0.229)	5	14	200	175	0.25	5	Form C
<a href="#">HE721R1200</a>				12	22	500				
<a href="#">HE721R2400</a>				24	44	2000				
<a href="#">HE722A0500</a>	Reed Relay, DIL, DPST-NO	19.05 (.750) × 7.22 (0.284) × 5.50 (0.217)	20.14 (0.793) × 7.62 (0.300) × 5.82 (0.229)	5	12	200	200	0.5	10	Form A
<a href="#">HE722A1200</a>				12	22	500				
<a href="#">HE722A2400</a>				24	46	2150				
<a href="#">HE751A0500</a>	Reed Relay, DIL, SPST-NO, High Voltage	19.05 (.750) × 7.22 (0.284) × 5.50 (0.217)	20.14 (0.793) × 7.62 (0.300) × 5.82 (0.229)	5	12	500	300	0.5	10	Form A
<a href="#">HE751A1200</a>				12	31	1000				
<a href="#">HE751A2400</a>				24	46	2150				

## Hall Effect Sensors

Flat Flange Mount



Product Series	Description	Overall Dimensions	Operating Supply Voltage	Operating Supply Current	Output Type	Output High	Output Low	Temperature Rating	
		mm (inch)						Vdc	mA
		L × W × H	Max.	Operating			Storage		
<a href="#">55100</a>	Miniature Flange Mount Hall, 2-Wire	25.50 (1.004) × 11.00 (0.433) × 3.00 (0.118)	3.75 to 24	N/A	Current	N/A	N/A	-40 to +100	-65 to +105
	Miniature Flange Mount Hall, 3-Wire	25.50 (1.004) × 11.00 (0.433) × 3.00 (0.118)	3.8 to 24	N/A	Voltage	Sinking/Open Collector	0.4 V @ 10 mA	-40 to +100	-65 to +105
	Miniature Flange Mount Hall, Analog	25.50 (1.004) × 11.00 (0.433) × 3.00 (0.118)	4.5 to 5.5	N/A	Analog Voltage	4.65 V	0.35 V	-40 to +100	-65 to +105
<a href="#">55110</a>	LED Flange Mount Hall	34.00 (1.399) × 14.00 (0.551) × 10.00 (0.394)	3.8 to 24	N/A	Voltage	Vdd-2 @ 0.1 mA	0.4 V @ 20 mA	-40 to +85	-65 to +85

For details on electrical specifications, visit [littelfuse.com](http://littelfuse.com).

A: SPST-NO = Single Pole Single Throw – Normally Open.  
 C: SPDT-CO = Single Pole Double Throw – Change Over.  
 NO = Normally Open.



## Hall Effect Sensors (Continued)

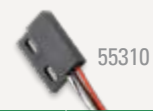
### Flat Pack



55140



55300



55310

Product Series	Description	Overall Dimensions	Operating Supply Voltage	Operating Supply Current	Output Type	Output High	Output Low	Temperature Rating	
		mm (inch)		mA			Max.	°C	
		L × W × H	Vdc	Max.			Operating	Storage	
55140	Flange Mount Hall, 2-Wire	23.00 (0.906) × 14.00 (0.551) × 6.00 (0.236)	3.75 to 24	N/A	Current	N/A	2.2 - 5.6 mA	-40 to +100	-65 to +105
	Flange Mount Hall, 3-Wire	23.00 (0.906) × 14.00 (0.551) × 6.00 (0.236)	3.8 to 24	N/A	Voltage	Sinking/Open Collector	0.4 V @ 20 mA	-40 to +100	-65 to +105
	Flange Mount Hall, Analog	23.00 (0.906) × 14.00 (0.551) × 6.00 (0.236)	4.5 to 5.5	N/A	Analog Voltage	4.65 V	0.35 V	-40 to +100	-65 to +105
55300	Flat Pack Rotary Hall	28.50 (1.122) × 20.40 (0.803) × 6.35 (0.250)	4.5 to 5.5	16	Analog Voltage or PWM	4.5 V	0.5 V	-40 to +105	-65 to +105
55310	Flat Pack Digital Hall	28.50 (1.122) × 20.40 (0.803) × 6.35 (0.250)	4.75 to 24	6	Current	N/A	20 mA	-40 to +105	-65 to +105

### Round Flange Mount



55505

Product Series	Description	Overall Dimensions	Operating Supply Voltage	Operating Supply Current	Output Type	Output High	Output Low	Temperature Rating	
		mm (inch)		mA			Max.	°C	
		L × W × H	Vdc	Max.			Operating	Storage	
55505	Flange Mount Geartooth Hall	17.86 (0.703) × 36.75 (1.447) × 41.40 (0.551)	4.75 to 24	N/A	Digital	Vdd-2	0.6 V @ 20 mA	-40 to +125	-65 to +125

### Threaded Barrel



55075

Product Series	Description	Overall Dimensions	Operating Supply Voltage	Operating Supply Current	Output Type	Output High	Output Low	Temperature Rating	
		mm (inch)		mA			Max.	°C	
		Thread Pitch × L	Vdc	Max.			Operating	Storage	
55075	Stainless Steel M12 Geartooth Hall	M12 × 1 Pitch × 46.00 (1.811)	4.75 to 25.2	N/A	Digital	Vdd-2	0.6 V @ 20 mA	-40 to +85	-65 to +85

### Rotary/Angular



55250

Product Series	Description	Overall Dimensions	Operating Supply Voltage	Operating Supply Current	Output Type	Output High	Output Low	Temperature Rating	
		mm (inch)		mA			Max.	°C	
		L × W × H	Vdc	Max.			Operating	Storage	
55250	Rotary Hall	50.00 (1.968) × 37.30 (1.469) × 28.25 (1.112)	4.5 to 5.5	16	Analog Voltage or PWM	4.5 V	0.5 V	-40 to +125	-65 to +125

# Magnetic Actuators

## Rectangular



Product Series	Description	Overall Dimensions		Material	Recommended Operating Temp.	
		mm (inch)			°C	
		L x W x H				Max.
<a href="#">H-31</a>	AlNiCo Magnet	12.70 (0.500) × 1.60 (0.062) × 1.60 (0.062)		AlNiCo-5	450	
<a href="#">H-32</a>	AlNiCo Magnet	25.40 (1.000) × 4.80 (0.190) × 4.80 (0.190)		AlNiCo-5	450	
<a href="#">H-33</a>	AlNiCo Magnet	19.10 (0.750) × 3.20 (0.120) × 3.20 (0.120)		AlNiCo-5	450	
<a href="#">H-34</a>	AlNiCo Magnet	25.40 (1.000) × 6.35 (0.250) × 6.35 (0.250)		AlNiCo-5	450	
<a href="#">H-40</a>	Neodymium Magnet	7.62 (0.300) × 3.18 (0.125) × 3.18 (0.125)		NdFeB 45H	120	
<a href="#">H-41</a>	Neodymium Magnet	19.05 (0.750) × 3.18 (0.125) × 3.18 (0.125)		NdFeB 35H	120	
<a href="#">H-58</a>	Neodymium Magnet	21.00 (0.827) × 7.00 (0.276) × 4.70 (0.185)		NdFeB 35H	120	
<a href="#">57105</a>	Actuator for Terminal Flange Mount Sensor	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)		AlNiCo-5	105	
<a href="#">57125</a>	Actuator for Pinned Flange Mount Sensor	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)		AlNiCo-5	105	
<a href="#">57135</a>	Actuator for High-Temp Flange Mount Sensor	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)		AlNiCo-5	150	
<a href="#">57140</a>	Actuator for Mini Flange Mount Sensor	23.00 (0.906) × 14.00 (0.551) × 6.00 (0.236)		AlNiCo-5	105	
<a href="#">57141</a>	Actuator for Mini Flange Mount Sensor	23.00 (0.906) × 14.00 (0.551) × 6.00 (0.236)		AlNiCo-5	105	
<a href="#">57142</a>	Actuator for Mini Flange Mount Sensor	23.00 (0.906) × 14.00 (0.551) × 6.00 (0.236)		NdFeB 35H	105	
<a href="#">57145</a>	Actuator for Flange Mount Sensor	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)		AlNiCo-5	105	
<a href="#">57150</a>	Actuator for Flange Mount Sensor	28.57 (1.125) × 19.05 (0.750) × 6.35 (0.250)		AlNiCo-5	105	
<a href="#">57045</a>	Actuator for Mini PCB Mount Overmolded	17.78 (0.700) × 3.30 (0.130) × 4.32 (0.170)		AlNiCo-5	105	
<a href="#">57050</a>	Actuator for PCB Mount Overmolded	22.86 (0.900) × 4.57 (0.180) × 4.57 (0.180)		AlNiCo-5	105	

## Cylindrical



Product Series	Description	Overall Dimensions		Material	Recommended Operating Temp.	
		mm (inch)			°C	
		ø × L				Max.
<a href="#">H-35</a>	Neodymium Magnet	6.35 (0.250) × 6.35 (0.250)		NdFeB 35H	120	
<a href="#">H-48</a>	Neodymium Magnet	4.40 (0.173) × 6.00 (0.236)		NdFeB 35SH	150	
<a href="#">CM-1</a>	Ceramic Magnet	12.70 (0.500) × 5.08 (0.200)		Ceramic-5	250	
<a href="#">H-36</a>	AlNiCo Magnet	4.60 (0.182) × 25.40 (1.000)		AlNiCo-5	450	
<a href="#">H-315</a>	AlNiCo Magnet	3.00 (0.118) × 15.00 (0.590)		AlNiCo-5	450	
<a href="#">H-420</a>	AlNiCo Magnet	4.00 (0.157) × 20.0 (0.787)		AlNiCo-5	450	
<a href="#">H-625</a>	AlNiCo Magnet	6.00 (0.236) × 25.0 (0.984)		AlNiCo-5	450	
<a href="#">57020</a>	Actuator for Mini Cylindrical Sensor	5.10 (0.201) × 15.24 (0.600)		AlNiCo-5	105	
<a href="#">57022</a>	Actuator for Cylindrical Sensor	5.80 (0.228) × 25.40 (1.000)		AlNiCo-5	105	
<a href="#">57025</a>	Actuator for Cylindrical Sensor	6.22 (0.245) × 25.40 (1.000)		AlNiCo-5	105	
<a href="#">57030</a>	Actuator for Long Cylindrical Sensor	6.22 (0.245) × 38.10 (1.500)		AlNiCo-5	105	
<a href="#">57040</a>	Actuator for Cylindrical Sensor with Retaining Ribs	9.5 (0.375) × 31.00 (1.220)		NdFeB 35H	105	
<a href="#">57060</a>	Actuator for Stainless Threaded Barrel Sensor	M8 × 1.25 Pitch × 36.00 (1.420)		AlNiCo-5	105	
<a href="#">57065</a>	Actuator for Threaded Barrel Sensor (Standard)	(5/16 × 24) Pitch × 38.10 (1.500)		AlNiCo-5	105	
<a href="#">57070</a>	Actuator for Threaded Barrel Sensor (Metric)	M8 × 1.25 Pitch × 38.10 (1.500)		AlNiCo-5	105	
<a href="#">57075</a>	Actuator for Heavy Duty Threaded Barrel	M12 × 1.00 Pitch × 46.00 (1.810)		Ceramic-2	105	

For details on electrical specifications, visit [littelfuse.com](http://littelfuse.com).

# Leaded Thermistors

Epoxy Coated Thermistors											
Product Series	Description	Overall Dimensions	Resistance	Resistance Tolerance	R-T Curve	Temperature Coefficient	Beta Nominal	Dissipation Constant, Nominal	Thermal Time Constant, Max. - Still Air	Thermal Time Constant, Max. - Well-Stirred Oil	Temperature Rating
		Inches	Ohms	± %		% / °C	K	mW / °C	Seconds	Seconds	°C
		Bead W × Lead L	@ 25°C	@ 25°C		@ 25°C	0-50°C				
<a href="#">KC</a>	Miniature Leaded Epoxy Coated Thermistors (135°C), Kynar Insulated Lead Wire	0.095 × 1.5	100 - 100,000	1; 10	B, F, G, J, N1, R	3.3 - 4.68	2941 - 4140	1	10	1	-55 to +135
<a href="#">LC</a>	Miniature Leaded Epoxy Coated Thermistors (150°C), Tinned Solderable Wire	0.095 × 1.5	100 - 100,000	2; 5; 10	B, E, F, G, H, J, R	3.3 - 4.68	2941 - 4140	1	10	1	-55 to +150
<a href="#">SC</a>	Miniature Leaded Epoxy Coated Thermistors (150°C), Tinned Solderable Wire	0.095 × 1.5	50,000 - 100,000	5	J	4.4 - 4.5	3892	2	10	---	-55 to +150
<a href="#">TC</a>	Miniature Leaded Epoxy Coated Thermistors (150°C), Teflon Insulated Wire	0.095 × 1.5	100 - 100,000	10	B, F, G, J, R	3.3 - 4.68	2941 - 4140	1	10	1	-55 to +150
<a href="#">AC</a>	Miniature Leaded Epoxy Coated Thermistors (125°C), Tinned Solderable Lead Wire	0.140 × 0.675	10,000	1	E1, J	4.4	3892	2	15	3	-55 to +125
<a href="#">DC</a>	Miniature Leaded Epoxy Coated Thermistors (150°C), Tinned Solderable Lead Wire	0.125 × 1.0	100 - 100,000	1; 2; 10	B, F, G, J, R	3.3 - 4.68	2941 - 4140	3	15	2 - 3	-55 to +150

Glass Probe Thermistors											
Product Series	Description	Overall Dimensions	Resistance	Resistance Tolerance	R-T Curve	Temperature Coefficient	Beta Nominal	Dissipation Constant, Nominal	Thermal Time Constant, Max. - Still Air	Thermal Time Constant, Max. - Well-Stirred Oil	Temperature Rating
		Inches	Ohms	± %		% / °C	K	mW / °C	Seconds	Seconds	°C
		Body Ø × Body L	@ 25°C	@ 25°C		@ 25°C	25-85°C				
<a href="#">GL</a>	High-Temperature Glass Housing Thermistors (300°C), Tinned Solderable Lead Wire	0.070 × 0.500	2252	10	J	4.4	3977	---	---	---	-55 to +250

For details on electrical specifications, visit [littelfuse.com](http://littelfuse.com).



## Product Overview Thermal Sensing Solutions: Thermistors, RTDs, Probe Assemblies

Littelfuse offers a broad range of thermistors, RTDs, probes, and assemblies for demanding temperature sensing applications worldwide. To learn more, download the Temperature Sensors Product Overview.



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# Leaded Thermistors (Continued)

Glass Coated Chip Thermistors											
Product Series	Description	Overall Dimensions	Resistance	Resistance Tolerance	R-T Curve	Temperature Coefficient	Beta Nominal	Dissipation Constant, Nominal	Thermal Time Constant, Max. - Still Air	Thermal Time Constant, Max. - Well-Stirred Oil	Temperature Rating
		Inches	Ohms	± %		% / °C	K	mW / °C	Seconds	Seconds	°C
		Bead $\phi$ × Lead L	@ 25°C	@ 25°C		@ 25°C	25-85°C				
<a href="#">GQ</a>	Radial Leaded Glass Coated Chip Thermistors (0.140" Dia.), Solderable Lead Wire	0.140 × 1.00	2252	10	J	4.4	3977	---	---	---	-55 to +250
<a href="#">GR</a>	Radial Leaded Glass Coated Chip Thermistors (0.090" Dia.), Solderable Lead Wire	0.090 × 1.00	100 - 100,000	10; 20	B7, E1, F, J, R	3.18 - 4.68	2826 - 4263	1.3	14	---	-55 to +300
<a href="#">GS</a>	Radial Leaded Glass Coated Chip Thermistors (0.060" Dia.), Solderable Lead Wire	0.060 × 1.00	200 - 1,000,000	10	E1, G, J, R	3.38 - 5.25	3047 - 4668	0.7	5	---	-55 to +300
<a href="#">GT</a>	Radial Leaded Glass Coated Chip Thermistors (0.039" Dia.), Solderable Lead Wire	0.039 × 1.00	1,000 - 1,000,000	10	B, E1, F, J, L1, N1, U1	3.3 - 4.52	3009 - 4350	0.45	2.5	---	-55 to +300

Glass Encapsulated Thermistors											
Product Series	Description	Overall Dimensions	Resistance	Resistance Tolerance	R-T Curve	Temperature Coefficient	Beta Nominal	Dissipation Constant, Nominal	Thermal Time Constant, Max. - Still Air	Thermal Time Constant, Max. - Well-Stirred Oil	Temperature Rating
		Inches	Ohms	± %		% / °C	K	mW / °C	Seconds	Seconds	°C
		Body $\phi$ × Body L	@ 25°C	@ 25°C		@ 25°C	0-50°C				
<a href="#">DO-34 Standard</a>	Glass Encapsulated Thermistors (300°C), DO-34 Package, Tinned CCS Lead Wire	0.065 × 0.110	2,000 - 330,000	10	F, J, N1, R	3.86 - 4.68	3419 - 4263	2	5	0.5	-55 to +300
<a href="#">DO-35 Standard</a>	Glass Encapsulated Thermistors (300°C), DO-35 Package, Tinned CCS Lead Wire	0.075 × 0.160	500 - 5,000,000	1; 2; 3; 5; 10	B, E, E1, F, F13, G, H, J, L1, N1, R, V3, V4, Y, Y1	3.3 - 5.33	2941 - 4640	2	2 - 8	0.5 - 1	-55 to +300
<a href="#">DO-41 Standard</a>	Glass Encapsulated Thermistors (300°C), DO-41 Package, Tinned CCS Lead Wire	0.110 × 0.170	100 - 33,000	10	B, F, J, R	3.31 - 4.68	2941 - 4140	3	8	2	-55 to +300
<a href="#">JL</a>	Interchangeable Glass Encapsulated Thermistors, DO-35 Package, ± 0.5°C Accuracy	0.075 × 0.160	10,000 - 100,000	---	J	4.4	3892	2	5	0.5	-55 to +300
<a href="#">JM</a>	Interchangeable Glass Encapsulated Thermistors, DO-35 Package, ± 1.0°C Accuracy	0.075 × 0.160	10,000 - 100,000	---	J	4.4	3892	2	5	0.5	-55 to +300
<a href="#">USUG1000</a>	UL Recognized Glass Encapsulated Thermistors, DO-35 Package	0.075 × 0.160	10,000 - 250,000	2; 5; 10	J	3.67	3892	2	---	---	-40 to +150

For details on electrical specifications, visit [littelfuse.com](http://littelfuse.com).

## Leaded Thermistors (Continued)

Interchangeable Thermistors												
Product Series	Description	Overall Dimensions	Resistance	Accuracy	R-T Curve	Temperature Coefficient	Beta Nominal	Dissipation Constant, Nominal	Thermal Time Constant, Max. - Still Air	Thermal Time Constant, Max. - Well-Stirred Oil	Temperature Rating	Max. Storage & Operation Temperature for Best Long-Term Stability
		Inches	Ohms	± °C		% / °C	K	mW / °C	Seconds	Seconds	°C	
		Bead W × Bead L	@ 25°C	0-70°C		@ 25°C	0-50°C					
<a href="#">KS</a>	Standard Precision Interchangeable Thermistors (135°C), ± 0.1°C Accuracy, Kynar Insulated Leads	0.095 × 1.5	1,000 - 100,000	±0.1°C	G, J, R	4.04 - 4.68	3575 - 4140	1	10	1	-80 to +135	-80 to +75
<a href="#">KT</a>	Standard Precision Interchangeable Thermistors (135°C), ± 0.2°C Accuracy, Kynar Insulated Leads	0.095 × 1.5	1,000 - 100,000	±0.2°C	G, J, R	4.04 - 4.68	3575 - 4140	1	10	1	-80 to +135	-80 to +120
<a href="#">KW</a>	Precision Interchangeable Thermistors (135°C), ± 0.5°C Accuracy, Kynar Insulated Leads	0.095 × 1.5	1,000 - 100,000	±0.5°C	G, J, R	4.04 - 4.68	3575 - 4140	1	10	1	-80 to +135	-80 to +120
<a href="#">KX</a>	Precision Interchangeable Thermistors (135°C), ± 1.0°C Accuracy, Kynar Insulated Leads	0.095 × 1.5	1,000 - 100,000	±1.0°C	G, J, R	4.04 - 4.68	3575 - 4140	1	10	1	-80 to +135	-80 to +120
<a href="#">PR</a>	Ultra Precision Interchangeable Thermistors (80°C), ± 0.05°C Accuracy, Uninsulated Leads	0.095 × 1.5	2,252 - 50,000	±0.05°C	J	4.4	3892	1	10	1	-55 to +80	-55 to +50
<a href="#">PS</a>	Standard Precision Interchangeable Thermistors (150°C), ± 0.1°C Accuracy, Uninsulated Leads	0.095 × 1.5	1,000 - 100,000	±0.1°C	G, J, R	4.04 - 4.68	3575 - 4140	1	10	1	-80 to +135	-80 to +75
<a href="#">PT</a>	Standard Precision Interchangeable Thermistors (150°C), ± 0.2°C Accuracy, Uninsulated Leads	0.095 × 1.5	1,000 - 100,000	±0.2°C	G, J, R	4.04 - 4.68	3575 - 4140	1	10	1	-80 to +135	-80 to +120
<a href="#">PW</a>	Precision Interchangeable Thermistors (150°C), ± 0.5°C Accuracy, Uninsulated Leads	0.095 × 1.5	1,000 - 100,000	±0.5°C	E, G, J, R	3.67 - 4.68	3263 - 4140	1	10	1	-80 to +135	-80 to +120
<a href="#">PX</a>	Precision Interchangeable Thermistors (150°C), ± 1.0°C Accuracy, Uninsulated Leads	0.095 × 1.5	1,000 - 100,000	±1.0°C	E, G, J, R	3.67 - 4.68	3263 - 4140	1	10	1	-80 to +135	-80 to +120

## Surface Mount Thermistors

End-Banded Chip Thermistors									
Product Series	Description	Overall Dimensions	Resistance	Resistance Tolerance	Temperature Coefficient	Beta Nominal	Max. Power Rating	Temperature Rating	
		Inches	Ohms	± %	A	K	mW	°C	
		L × W × T	@ 25°C	@ 25°C	@ 25°C	25-85°C			
<a href="#">RA</a>	Surface Mount End-Banded Chip Thermistors 0402 Style (125°C)	0.0394 × 0.0197 × 0.208	10,000 - 200,000	1; 5	-4.4	3800 - 4250	40mW	-40 to +125	
<a href="#">RB</a>	Surface Mount End-Banded Chip Thermistors 0603 Style (125°C)	0.063 × 0.0315 × 0.0395	1,000 - 200,000	5	-4.4	3250 - 4250	150mW	-40 to +125	
<a href="#">KR</a>	Surface Mount End-Banded Chip Thermistors 0805 Style (125°C)	0.0787 × 0.0492 × 0.050	1,000 - 200,000	5	-4.4	3250 - 4250	300mW	-40 to +125	
<a href="#">LR</a>	Surface Mount End-Banded Chip Thermistors 1206 Style (125°C)	0.126 × 0.063 × 0.050	1,000 - 500,000	5	---	3250 - 4250	320 - 400 mW	-40 to +125	

For details on electrical specifications, visit [littelfuse.com](http://littelfuse.com).

## Surface Mount Thermistors (Continued)

### Leadless Top-Bottom Terminated Chip Thermistors



Product Series	Description	Overall Dimensions	Resistance	Resistance Tolerance	R-T Curve	Temperature Coefficient	Beta Nominal	Dissipation Constant, Nominal	Thermal Time Constant, Max. - Still Air	Temperature Rating
		Inches	Ohms	± %		% / °C	K	mW / °C	Seconds	°C
		L × W × T	@ 25°C	@ 25°C		@ 25°C	0-50°C			
<a href="#">BC</a>	Leadless Top/Bottom Terminated Chip Thermistors (150°C)	Various Sizes	100 - 100,000	10	B, F, J, R	-4.68 to -3.31	2941 - 4140	1	2	-55 to +150

### MELF Style Thermistors



Product Series	Description	Overall Dimensions	Resistance	Resistance Tolerance	R-T Curve	Temperature Coefficient	Beta Nominal	Dissipation Constant, Nominal	Thermal Time Constant, Max. - Still Air	Temperature Rating
		Inches	Ohms	± %		% / °C	K	mW / °C	Seconds	°C
		ø × L	@ 25°C	@ 25°C		@ 25°C	0-50°C			
<a href="#">MM</a>	Surface Mount NTC LL-31 MicroMELF Style (220°C)	0.049 × 0.075	2,186 - 200,000	1; 10	E1, F, G, J, R	-4.68 to -3.82	3320 - 4140	1	5	-55 to +220
<a href="#">HM</a>	Surface Mount NTC LL-34 MiniMELF Interchangeable (220°C) ±0.5°C Accuracy	0.0603 × 0.135	10,000 - 100,000	0.5	J	-4.4	3892	2	8	-55 to +220
<a href="#">SM</a>	Surface Mount NTC LL-34 MiniMELF Style (220°C)	0.060 × 0.135	500 - 1,000,000	1; 10	B, D2, E, E1, F, G, J, R, V3	-4.93 to -3.3	2941 - 4369	2	8	-55 to +220
<a href="#">WM</a>	Surface Mount NTC LL-34 MiniMELF Interchangeable (220°C) ±1.0°C Accuracy	0.060 × 0.135	10,000 - 100,000	---	---	-4.4	3892	2	8	-55 to +220
<a href="#">SB</a>	Surface Mount NTC LL-41 MELF Style (220°C)	0.060 × 0.135	1,000 - 20,000	10	F, J, R	-4.68 to -3.68	3419 - 4140	3	8	-55 to +220

## Power Thermistors

### Inrush Current Limiting Thermistors



Product Series	Description	Disc Dimensions	Resistance	Resistance Tolerance	Max Steady State Current	Nominal Resistance @ Max. Current	Lead Diameter Nominal
		Inches	Ohms	± %	A	Ohms	Inches
		Diameter	@ 25°C	@ 25°C	I <sub>max</sub>	R <sub>I_max</sub>	
<a href="#">SI</a>	Inrush Current Limiters (Power Thermistors)	0.275 - 1.475	0.7 - 200	15; 20; 25; 30	0.1 - 30	0.015 - 6.3	0.018 - 0.04

## Technical Information

### What is a Thermistor?

Thermistors are thermally sensitive resistors whose prime function is to exhibit a large, predictable, and precise change in electrical resistance when subjected to a corresponding change in body temperature. To learn more, visit the Thermistor Technical Information page.



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# Leaded RTDs

Thin-Film Plated RTD Sensors													
Product Series	Description	Overall Dimensions			Resistance	Resistance Tolerance	DIN 43760 Class	IEC 60751 Class	Temperature Deviation	Temperature Coefficient of Resistance	Dissipation Constant, Nominal	Thermal Time Constant, Max. - 1 m/s Moving Air	Temperature Rating
		Inches			Ohms	± %			± °C				
		Body L × W × T			@ 0°C	@ 0°C			@ 0°C				
PPG	Thin-Film Platinum RTDs	0.0315 × 0.1181 × 0.049 or 0.0472 × 0.063 × 0.049 or 0.118 × 0.079 × 0.049			100 - 1000	0.06; 0.12; 0.24	B, C	F 0.15	0.15 - 0.6	3750 - 3850	1.8 - 2.2	1.2 - 15	-200 to +600

# Digital Temperature Indicators

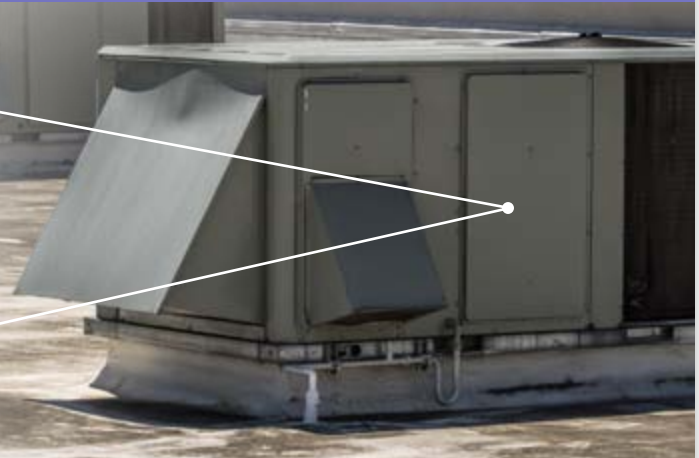
Digital Temperature Indicators																			
Product Series	Description	Overall Dimensions			Indicating Temperature			Resistance		Hold Current	Trip Current	Withstand Voltage	Max. Fault Current	Power Dissipated	Time-to-Trip Current	Time-to-Trip	R <sub>min</sub>	R <sub>max</sub>	Temperature Rating
		Inches			°C			Ohms		A	A	Vdc	A	W	A	Seconds	Ohms	Ohms	°C
		L × W × T			Minimum	Typical	Maximum	Max. @ 25°C	Indicating			Maximum	Maximum	Typical	Maximum	Minimum	Maximum		
setP™	Digital Temperature Indicators, Surface Mount, 0805 Size	0.087 × 0.059 × 0.024			90	100	110	6; 12	35,000	0.06 - 0.075	0.25 - 0.30	6	1	0.6	0.3	1 - 5	0.5	6 - 12	-40°C to +85°C

For details on electrical specifications, visit [littelfuse.com](http://littelfuse.com).

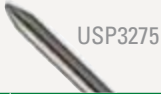
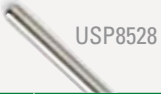
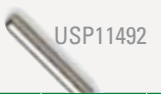
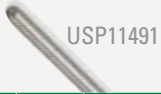
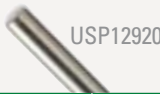
## How is the Sensor Used Here?


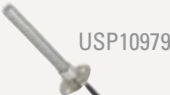
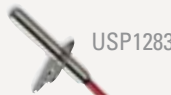
### USP10973 NTC Thermistor Probe with Copper Housing

At least two sensors per system are measuring the refrigerant line temperature in the water source heat pump.



# Thermistor Probes and Assemblies

Straight/Cylindrical										
    										
Product Series	Description	Overall Dimensions	Nominal Resistance	Resistance Tolerance	Temperature Accuracy	R-T Curve	Temperature Coefficient	Beta	Operating Temperature	Max. Storage & Operation Temperature for Best Long-Term Stability
		Inches	Ohms	± %	± °C		% / °C	K	°C	°C
		Probe $\phi$ × Probe L	@ 25° C	@ 25° C	0-70° C		@ 25° C	0-50° C	°C	Maximum
<a href="#">USP3275</a>	Stainless Steel Housing - Pointed Tip, Teflon Insulated Lead Wire	0.188 × 10.00	10,000	5	---	J	-4.4	3892	-55 to +105	---
<a href="#">USP7806</a>	Stainless Steel Housing, PFA Insulated Zip Cord	0.125 × 1.500	100,000	4.78	1.0 (+25°C)	V	-4.78	---	-55 to +150	---
<a href="#">USP8528</a>	Stainless Steel Housing and Spring, PFA Insulated Lead Wire	0.188 × 2.250	10,000	---	0.20 (+25 to +80°C)	J	-4.4	3892	-55 to +125	---
<a href="#">USP10972</a>	Stainless Steel Housing, PVC Insulated Zip Cord, Moisture Resistant	0.250 × 2.00	10,000	1	---	J	-4.4	3892	-55 to +105	---
<a href="#">USP11491</a>	Stainless Steel Housing, Teflon Insulated Lead Wire	0.125 × 2.50	10,000	---	0.20	J	-4.4	3892	-55 to +150	+120
<a href="#">USP11492</a>	Stainless Steel Housing, Teflon Insulated Lead Wire	0.188 × 1.50	10,000	---	0.20	J	-4.4	3892	-55 to +150	+120
<a href="#">USP12920</a>	Stainless Steel Housing, Glass Braid Insulated, Glass Braid Jacketed Wire	0.250 × 2.00	100,000	1	---	J	-4.4	3892	-55 to +300	---

Flanged										
  										
Product Series	Description	Overall Dimensions		Nominal Resistance	Resistance Tolerance	R-T Curve	Temperature Coefficient	Beta	Operating Temperature	
		Inches		Ohms	± %		% / °C	K	°C	
		Probe $\phi$ × Probe L	Flange L × Flange W	@ 25° C	@ 25° C		@ 25° C	0-50° C	°C	
<a href="#">USP9728</a>	Stainless Steel Housing, #6 Stud Mounting Holes, Glass Braid Insulated, Glass Braid Jacketed Wire	0.250 × 2.250	0.815 $\phi$	100,000	2	J	-4.4	3892	-55 to +300	
<a href="#">USP10979</a>	Stainless Steel Housing, #6 Stud Mounting Holes, Moisture Resistant	0.250 × 2.250	0.815 $\phi$	10,000	1	J	-4.4	3892	-55 to +105	
<a href="#">USP12836</a>	Stainless Steel Housing, 0.1772" Dia. Mounting Hole, PVC Zip Cord Lead Wire	0.1772 × 1.1811	0.7874 × 0.4724	10,000	1	J	-4.4	3977	-55 to +105	

For details on electrical specifications, visit [littelfuse.com](http://littelfuse.com).

## Technical Information

### Thermistor Terminology and Technical Vocabulary

Thermistors have specific terminologies and definitions related to their unique types, characteristics, and measurements. Littelfuse created a glossary page defining these terms. Read on to learn more.



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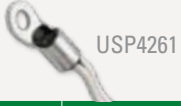
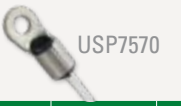
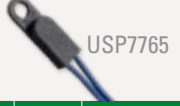
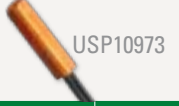
# Thermistor Probes and Assemblies (Continued)

Plastic											
		USP4065		USP10680		USP14579		USP11493		USP12838	
Product Series	Description	Overall Dimensions	Nominal Resistance	Resistance Tolerance	Temperature Accuracy	R-T Curve	Temperature Coefficient	Beta	Operating Temperature	Max. Storage & Operation Temperature for Best Long-Term Stability	
		Inches	Ohms	± %	± °C		% / °C	K	°C	°C	
		Probe Ø × Probe L	@ 25° C	@ 25° C	0-70° C		@ 25° C	0-50° C	°C	Maximum	
<a href="#">USP4065</a>	Vinyl Housing, PVC Insulated Zip Cord	0.225 × 0.580	2,000	---	1.67 (-26.1 to +4.4° C)	F	-3.86	3419	-40 to +100	---	
<a href="#">USP7537</a>	Polyimide Tube Housing, Kynar Insulated Lead Wire	0.060 × 0.250	2,500	---	0.05 (0 to +50° C)	J	-4.4	3892	-55 to +80	+50	
<a href="#">USP10680</a>	Vinyl Housing, PVC Insulated Zip Cord	0.290 × 1.060	10,000	---	0.56 (+18.3 to +29.4° C)	J	-4.4	3892	-40 to +105	---	
<a href="#">USP10975</a>	Plastic Housing, Kynar Insulated Lead Wire	0.100 × 0.215	10,000	1	---	J	-4.4	3892	-55 to +125	---	
<a href="#">USP10982</a>	Vinyl Housing, PVC Insulated Lead Wire, Moisture Resistant	0.230 × 1.350	10,000	1	---	J	-4.4	3892	-40 to +80	---	
<a href="#">USP11493</a>	Vinyl Housing, PVC Insulated Zip Cord	0.225 × 0.580	2,252	---	0.10 (0 to +70° C)	J	-4.4	3892	-40 to +105	+75	
<a href="#">USP12838</a>	Vinyl Housing, PVC Insulated Lead Wire	0.089 × 0.340	10,000	1	---	J	-4.4	3892	-40 to +80	---	
<a href="#">USP14439</a>	Polyimide Tube Housing, Two Conductor PVC Insulated Lead Wire	0.085 × 0.375	10,000	---	0.10 (0 to +50° C)	J	-4.4	3892	-40 to +105	+75	
<a href="#">USP14579</a>	Positive Temperature Coefficient Thermistor, Plastic Housing, Teflon Insulated Lead Wire	0.155 × 0.500	1,000	2	---	---	---	---	-40 to +105	---	
<a href="#">USP17957</a>	Positive Temperature Coefficient Thermistor, Plastic Housing, Teflon Insulated Lead Wire	0.140 × 0.380	1,000	2	---	---	---	---	-40 to +105	---	

Micro Probes										
		USP12837								
Product Series	Description	Overall Dimensions	Nominal Resistance	Resistance Tolerance	Temperature Accuracy	R-T Curve	Temperature Coefficient	Beta	Operating Temperature	Max. Storage & Operation Temperature for Best Long-Term Stability
		Inches	Ohms	± %	± °C		% / °C	K	°C	°C
		Probe Ø × Probe L	@ 25° C	@ 25° C	0-70° C		@ 25° C	0-50° C	°C	Maximum
<a href="#">USP12837</a>	Polyimide Tube Housing, Poly-Nylon Insulated Lead Wire	0.020 × 0.150	10,000	1	---	J	-4.4	3892	-55 to +125	+100


Laboratory Grade										
		USP3986								
Product Series	Description	Overall Dimensions	Nominal Resistance	Resistance Tolerance	Temperature Accuracy	R-T Curve	Temperature Coefficient	Beta	Operating Temperature	
		Inches	Ohms	± %	± °C		% / °C	K	°C	
		Probe Ø × Probe L	@ 25° C	@ 25° C	-20 to +70° C		@ 25° C	0-50° C	°C	
<a href="#">USP3021</a>	Stainless Steel Housing, PVC Insulated Zip Cord, Supplied with NIST Traceable Calibration Certificate	0.250 × 9.50	10,000	2	0.01 (-20 to +70° C)	J	-4.4	3892	-55 to +105	
<a href="#">USP3986</a>	Stainless Steel Housing, PVC Insulated Zip Cord, Supplied with NIST Traceable Calibration Certificate	0.250 × 9.50	100,000	---	0.01 (0 to +105° C)	J	-4.4	3892	-55 to +105	

# Thermistor Probes and Assemblies (Continued)


Surface Temperature Sensing										
    										
Product Series	Description	Overall Dimensions	Nominal Resistance	Resistance Tolerance	Temperature Accuracy	R-T Curve	Temperature Coefficient	Beta	Operating Temperature	Max. Storage & Operation Temperature for Best Long-Term Stability
		Inches	Ohms	± %	± °C		% / °C	K	°C	°C
		Body L × W × T	@ 25° C	@ 25° C	0-70° C		@ 25° C	0-50° C	°C	Maximum
<a href="#">TO-220</a>	TO-220 Package Thermistors	0.595 × 0.400 × 0.165	5,000 - 10,000	1; 5; 10	---	J	-4.4	3892	-55 to +150	---
<a href="#">USUR1000</a>	UL Recognized NTC Thermistor Assemblies with #6 Ring Lug Housing	0.615 × 0.280 × 0.215	1,000 - 100,000	2; 3; 5; 10	---	J	-4.4	3892	-40 to +125	---
<a href="#">USP4261</a>	Ring Lug Housing, #6 Mounting Hole, PVC Insulated Zip Cord	0.615 × 0.280 × 0.215	10,000	1	---	J	-4.4	3892	-40 to +105	---
<a href="#">USP5510</a>	Flag Terminal Housing, #6 Mounting Hole, Teflon Insulated Lead Wire	0.310 × 0.645 × 0.220	10,000	---	0.50 (0 to +70°C)	J	-4.4	3892	-55 to +150	---
<a href="#">USP6295</a>	Ring Lug Housing, #4 Mounting Hole, Kynar Insulated Lead Wire	0.620 × 0.281 × 0.215	10,000	5	---	J	-4.4	3892	-55 to +125	---
<a href="#">USP6998</a>	Ring Lug Housing, 1/4" Mounting Hole, Teflon Insulated Lead Wire, Harwin Connector	1.270 × 0.445	200,000	1	---	R	-4.68	4140	-55 to +150	---
<a href="#">USP7570</a>	Ring Lug Housing, #6 Mounting Hole, Teflon Insulated Lead Wire	0.620 × 0.281 × 0.215	10,000	---	5.0 (+60 to +100°C)	J	-4.4	3892	-55 to +135	---
<a href="#">USP10976</a>	Ring Lug Housing, #6 Mounting Hole, Teflon Insulated Lead Wire	0.620 × 0.281	10,000	1	---	J	-4.4	3892	-55 to +150	+120
<a href="#">USP7765</a>	Overmolded Plastic Housing, UL1015 Style Lead Wire, Moisture Resistant	1.300 × 0.400 × 0.250	10,000	1	---	J	-4.4	3892	-40 to +105	---
<a href="#">USP7766</a>	Copper Housing, Supplied with 3 Copper-Plated Clips for Mounting to 0.3125", 0.375" & 0.500" Dia. Pipes, PVC Insulated Zip Cord, Moisture Resistant	0.787 × 0.164	10,000	1	---	J	-4.4	3892	-40 to +105	---
<a href="#">USP8798</a>	Copper Housing, Copper-Plated Clip for Mounting to 0.250" Dia. Pipe, PVC Insulated Zip Cord, Moisture Resistant	0.787 × 0.220 × 0.167	10,000	---	0.50 (+20 to +35°C)	J	-4.4	3892	-40 to +105	---
<a href="#">USP10973</a>	Copper Housing, PVC Insulated Zip Cord, Moisture Resistant	0.787 × 0.177 × 0.164	10,000	1	---	J	-4.4	3892	-40 to +105	---
<a href="#">USP18967</a>	Copper Housing, Copper-Plated Clip for Mounting to 0.875" Dia. Pipe, PVC Insulated Zip Cord, Moisture Resistant	0.787 × 0.233 × 0.164	10,000	1	---	J	-4.4	3977	-40 to +105	---


Threaded										
    										
Product Series	Description	Overall Dimensions		Nominal Resistance	Resistance Tolerance	R-T Curve	Temperature Coefficient	Beta	Operating Temperature	
		Inches		Ohms	± %		% / °C	K	°C	
		Probe ø × Probe L	Hex Head W × Plug L	@ 25° C	@ 25° C		@ 25° C	0-50° C	°C	
<a href="#">USP3121</a>	Aluminum Hex Housing, 6-32 Thread, Kynar Insulated Lead Wire	---	0.250 × 0.625	10,000	5	J	-4.4	3892	-55 to +125	
<a href="#">USP10978</a>	Brass Housing, 1/4"-18 NPT Thread, PVC Insulated Lead Wire	0.250 × 0.650	0.562 × 0.880	10,000	1	J	-4.4	3892	-55 to +105	
<a href="#">USP10981</a>	Stainless Steel Housing, 1/8"-27 NPT Thread, PVC Insulated Zip Cord, Moisture Resistant	0.250 × 1.250	0.4375 × 0.625	10,000	1	J	-4.4	3892	-55 to +105	
<a href="#">USP10997</a>	Brass Plug, 1/8"-27 NPT Thread, PVC Insulated Lead Wire	---	0.4375 × 0.560	10,000	5	J	-4.4	3892	-55 to +105	
<a href="#">USP12755</a>	Stainless Steel Housing, 5/16"-24 UNJF-3A Thread, PVC Insulated Lead Wire	0.188 × 0.500	0.500 × 0.650	10,000	---	E1	---	3435	-55 to +105	
<a href="#">USP12840</a>	Stainless Steel Hex Head Screw, 10-32 Thread, Kynar Insulated Lead Wire	---	0.3125 × 0.370	10,000	1	J	-4.4	3892	-55 to +125	




## Thermistor Probes and Assemblies (Continued)

Special Probes											
 USP16673											
Product Series	Description	Overall Dimensions	Nominal Resistance	Resistance Tolerance	Temperature Accuracy	R-T Curve	Temperature Coefficient	Beta	Dissipation Constant, Nominal	Thermal Time Constant, Nominal - Still Air	Operating Temperature
		Inches	Ohms	± %	± °C		% / °C	K	mW / °C	Seconds	°C
		Body L × W × T	@ 25° C	@ 25° C	0-70° C		@ 25° C	0-50° C			
<a href="#">USP16673</a>	Ultra-Thin Polyimide Insulation Film, Solderable Lead Wires	1.260 × 0.197 × 0.040	10,000	1	---	E1	---	3435	0.7	5	-30 to +90

## RTD Probes and Assemblies

Threaded								
 USW3483								
Product Series	Description	Overall Dimensions		Nominal Resistance	Resistance Tolerance	DIN 43760 Class	Temperature Coefficient of Resistance	Temperature Rating
		Inches		Ohms	%		ppm / °C	°C
		Probe Ø × Probe L	Hex Head W × Plug L	@ 25° C				Maximum
<a href="#">USW3483</a>	Stainless Steel Housing, 3/8"-18 NPT Thread, PVC Insulated Lead Wire	0.250 × 3.00	0.6875 × 0.750	1,000	0.06	A	3850	105

Plastic							
 USW2883							
Product Series	Description	Overall Dimensions	Nominal Resistance	Resistance Tolerance	DIN 43760 Class	Temperature Coefficient of Resistance	Temperature Rating
		Inches	Ohms	%		ppm / °C	°C
		Probe Ø × Probe L	@ 25° C				Maximum
<a href="#">USW2883</a>	Polyimide Housing, Uninsulated Nickel Lead Wire	0.110 × 0.220	500	0.12	B	3850	150

Surface Temperature Sensing								
 USW2295  USW2299  USW3866								
Product Series	Description	Overall Dimensions	Nominal Resistance	Resistance Tolerance	DIN 43760 Class	IEC 60751 Class	Temperature Coefficient of Resistance	Temperature Rating
		Inches	Ohms	%			ppm / °C	°C
		Ring Lug L × Ring Lug W	@ 0° C					Maximum
<a href="#">USW2295</a>	Ring Lug Housing, #6 Mounting Hole, Teflon Insulated Lead Wire	0.620 × 0.281	100	0.24	C	---	3850	150
<a href="#">USW2299</a>	Ring Lug Housing, #8 Mounting Hole, Teflon Insulated Lead Wire	0.720 × 0.312	1,000	0.12	B	---	3850	105
<a href="#">USW3866</a>	Ring Lug Housing, #10 Mounting Hole, PVC Insulated Lead Wire	0.750 × 0.375	1,000	0.12	B	F 0.3	3850	105

For details on electrical specifications, visit [littelfuse.com](http://littelfuse.com).

## Protect. Control. Sense.

Littelfuse is a trusted partner to engineers worldwide who seek our technical expertise to accurately conduct and analyze test results. Our global vision, team, and leadership collectively provide the strategic foundation to deliver innovations that help bolster businesses and align with global megatrends.

Littelfuse offers leading technologies in circuit protection, power control, and sensing. We continue to expand our broad and diverse portfolio of products into adjacent markets including Power Semiconductors, heavy-duty Switches, Magnetic, Optical, Electromechanical, and Temperature Sensors; and products that provide safe control and distribution of electrical power.

### Overcurrent Protection

- Fuses
- Resettable Positive Temperature Coefficient (PPTC) Devices

### Overvoltage Suppression

- Gas Discharge Tubes (GDTs)
- TVS Diode Arrays
- PLED Series Open LED Protectors
- SIDACTor® Protection Thyristors
- PulseGuard® ESD Suppressors
- Switching Thyristors
- TVS Diodes
- Varistors
- Power Control
- TRIAC Thyristors

### Power Semiconductors

- Bipolar Devices
- IGBTs
- MOSFETs
- Silicon Carbide Technology
- High Power Devices
- Discrete and Module Solutions
- Bare Die Devices
- Fully Engineered Subsystems

### Integrated Circuits and Solid State Relays

- High-Voltage ICs
- Solid-State Relays
- Gate Drivers

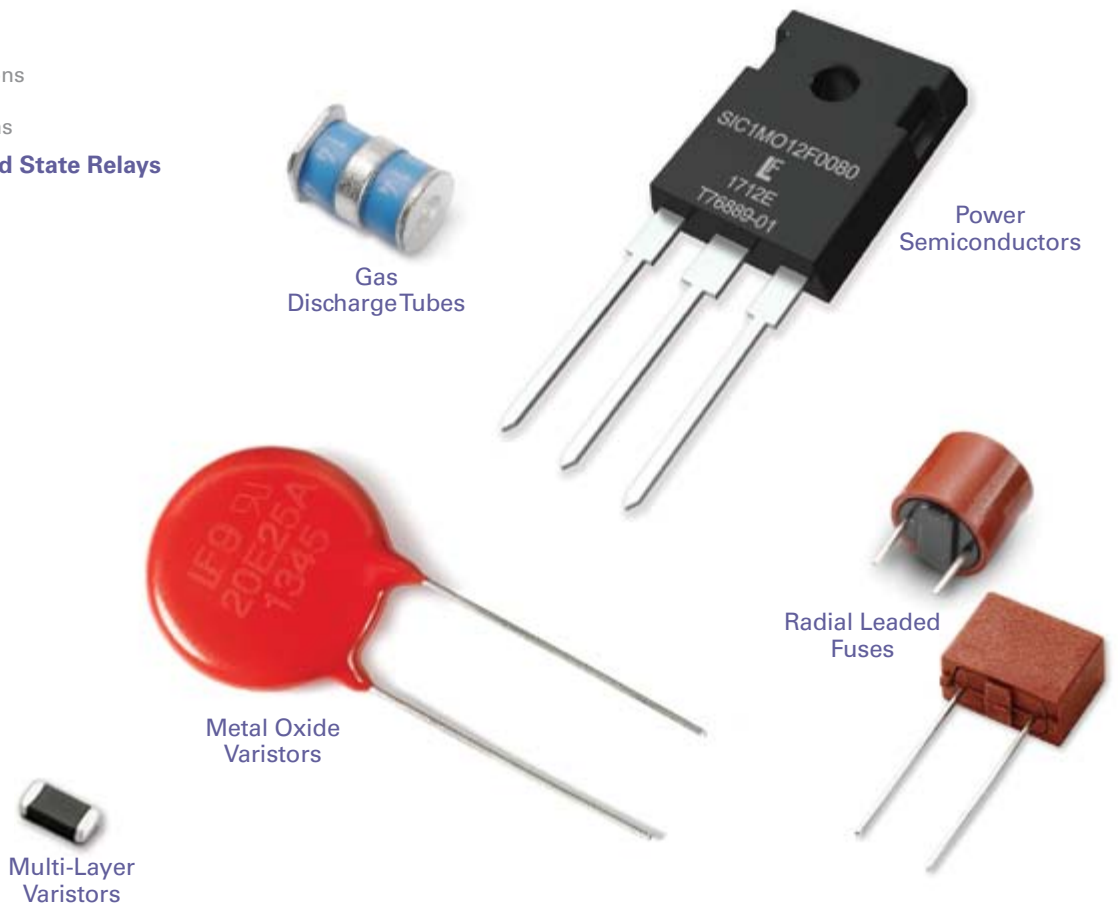
## Global Footprint

At Littelfuse, our mission is to develop innovative circuit protection, power control, and sensing solutions that meet our customers' unique needs. This customer-focused philosophy has helped us become the top circuit protection brand in the world.

Our industry-leading product portfolio includes reliable circuit protection, power control, and sensing products that are designed for a variety of markets and applications. We have assembled unparalleled expertise and developed a global footprint that puts our facilities close to our customers and target markets. As our global manufacturing and R&D teams objectively recommend the best circuit protection, power control, or sensing solution for each customer application, they form partnerships that will lead to the development of the next generation of advanced products.

### Littelfuse provides:

- Application Expertise
- Global Support
- Operational Excellence
- Technology Innovation
- Collaboration
- Customer Focus



## Additional Resources



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### Circuit Protection Products Selection Guide

This guide provides a summary of key circuit protection consideration factors, descriptions of the technologies Littelfuse offers, and product selection tables. It is designed to help you quickly find a protection solution appropriate to your application.



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This guide contains an overview of the components needed to keep datacenters operating efficiently and reliably in order to protect their assets.

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**Temperature Sensors Hotline: (800) 777-6467**

**Asia Sensors Technical Support: +86 512 67613189**

Littelfuse engineers are a phone call away to help identify potential issues and provide product recommendations to solve problems.

### Application and Field Support

Our experienced product and application engineers work step-by-step with customers from design to installation to determine the best solution.

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# Global Lab Capabilities



You need to be certain that your products live up to the highest standards for performance, reliability, safety, and regulatory compliance. Working with Littelfuse, you have access to dedicated application engineers who partner with you to provide expert design consultation, perform comprehensive tests simulating the harshest environments, and confidentially evaluate the results in consultation with you.

## TESTING CAPABILITIES

### Environmental

- Autoclave
- Dust
- H3TRB
- HAST
- High & Low Temperature Storage
- High Temperature Loading
- Ingress Protection (IP)
- HTGB
- HTRB
- Temperature & Humidity
- Temperature Cycling
- Thermal Shock
- Salt Fog

### Physical-Mechanical Characteristics

- Acceleration
- Die Shear
- Leak Detection
- Mechanical Shock
- Resistance to Soldering Heat (Dip, Reflow, Wave)
- Resistance to Solvents
- Solderability
- Terminal Strength (Push, Pull, Bend)
- Vibration
- Wetting Balance
- Wire Pull

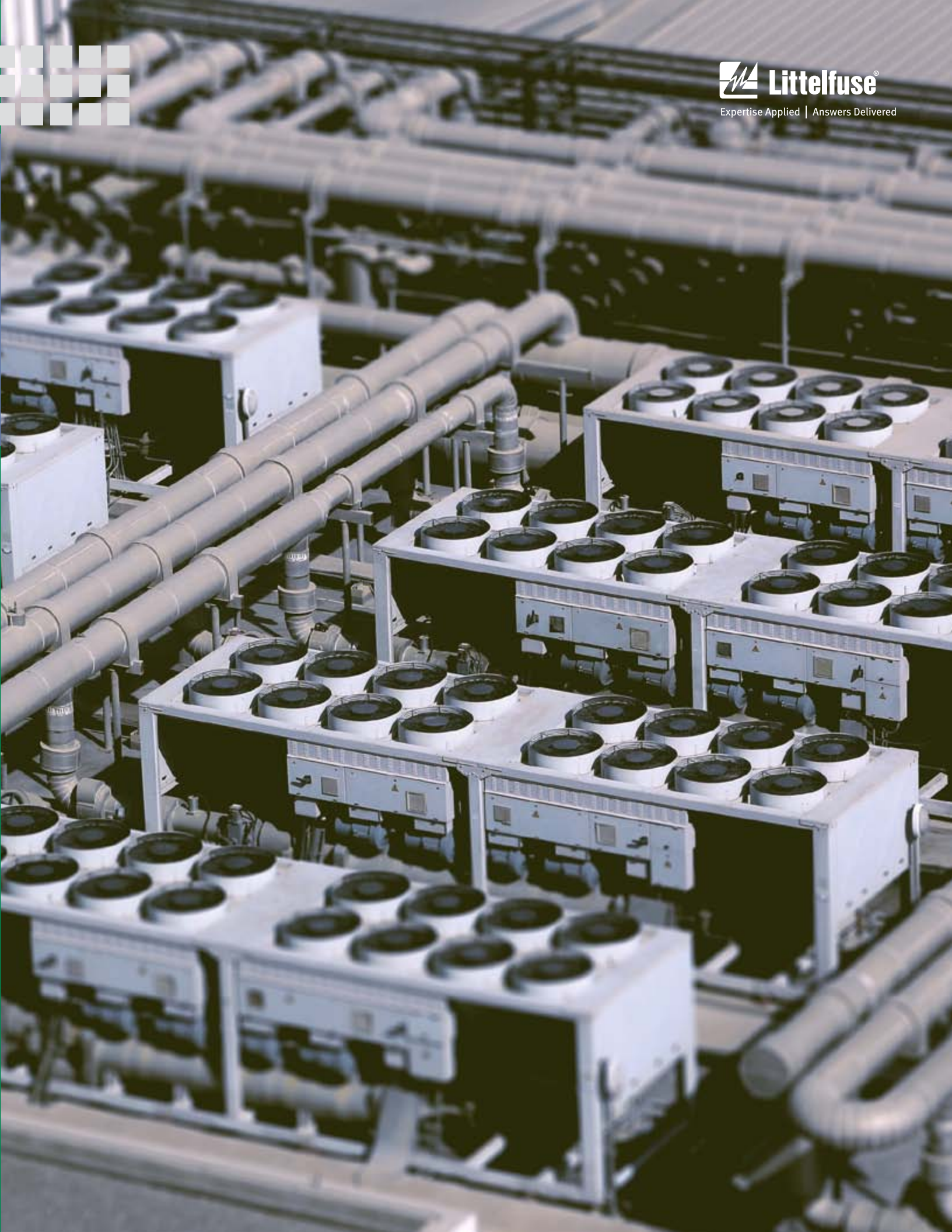
### Electrical

- BCI
- Capacitance
- EFT
- ESD
- Impedance
- Insulation Resistance
- I-V
- Life
- Lightning Surge
- Overload
- Parametric Tests
- Power-Cross
- Power Cycling
- Ring Wave
- R-T
- S-Parameter Measurements (Insertion Loss, Isolation, Reflection)
- Short Circuit
- Step Current
- Surface Resistivity
- Surge
- TDR (Eye Diagram)
- Telecom
- Thermal Cut-Off
- Time-to-Trip
- TLP
- Transient
- Trip Cycle
- Trip Endurance
- Voltage Drop



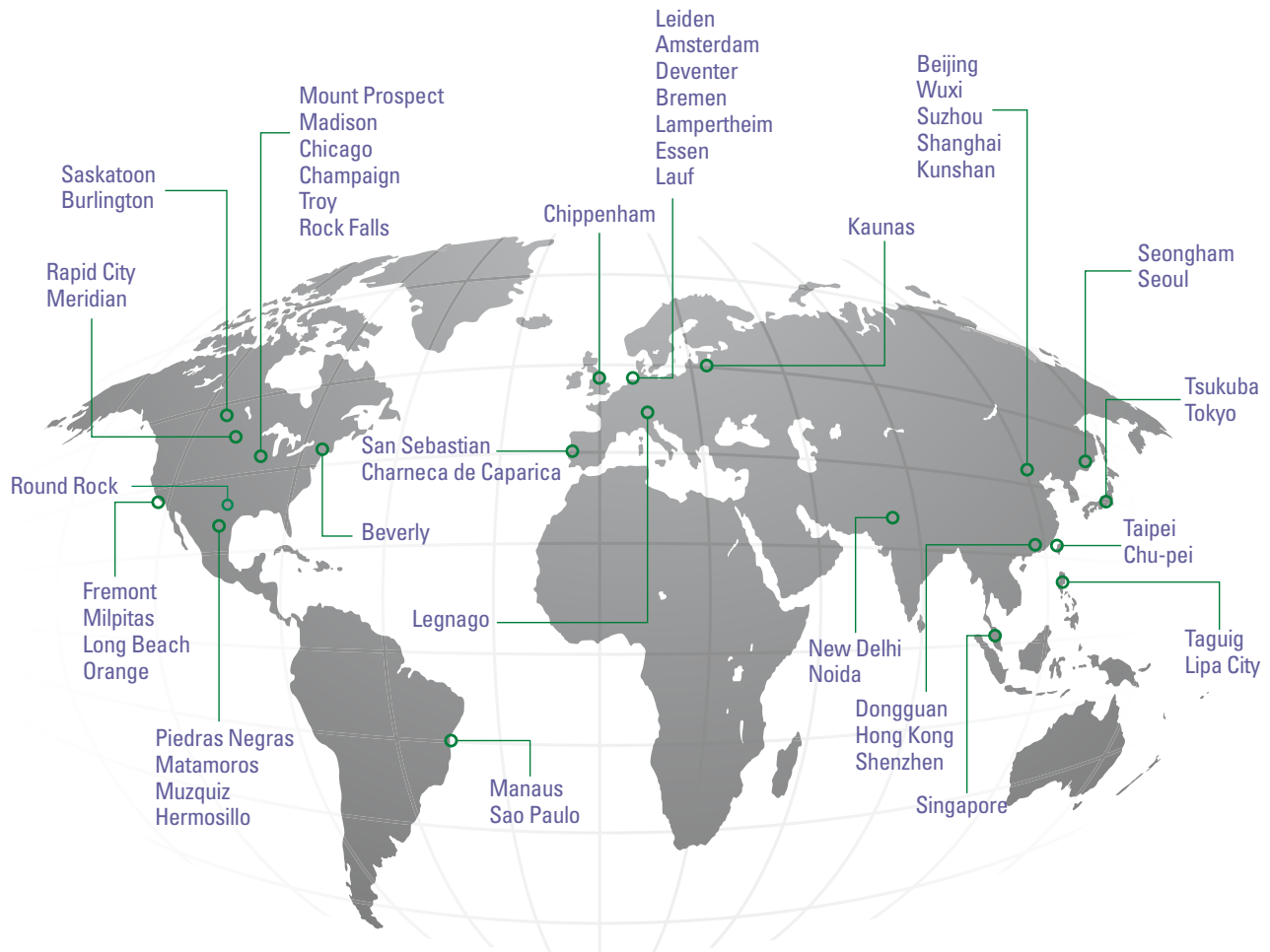
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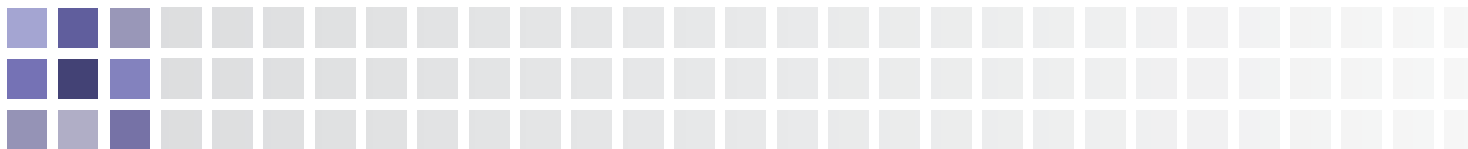




# LOCAL RESOURCES FOR A GLOBAL MARKET



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Expertise Applied | Answers Delivered