Reed Switch Signal/Electrical Requirements

HSI SENSING™
HERMETIC SWITCH INC.

Reed Switch Application Notes

APPLICATION NOTES: Reed Switch Signal / Electrical Requirements

Reed switches, though mechanical in nature, ultimately transfer current and voltage when it completes a circuit. HSI Sensing uses several basic definitions and formulas when determining the electrical and signal requirements for each application.

Maximum Switching Current

The maximum electrical current that will pass or is passing through the contact(s) at the time of closure or at the time of opening. More arcing will occur at the opening and closing of contacts when the current is at the maximum specified limit. Arcing between the contact(s) will shorten the life expectancy of the reed switch. Maximum Switching Current is measured in amperes DC or amperes peak AC.

Maximum Switching Voltage

The maximum circuit voltage allowed across the open contact(s). Reed switches are designed for tens of millions of cycles. One of the factors that may shorten the life of a reed switch is contact arcing. The higher the voltage, the greater the possibility of arcing. Arcing can cause metal transfer or damage the contact(s). To minimize contact arcing, it is imperative to select a reed switch with the appropriate features including vacuum, inert gas or pressurized inert gas. In general, applications switching above 250 volts require a reed switch with an internal vacuum or pressurized gas. Maximum switching voltage is less than the breakdown voltage.

Maximum Switching Power

The maximum recommended switching power (in Watts or VA) that the contacts can withstand. Switching power is calculated by multiplying the open-circuit voltage across the switch by the closed-circuit current that will flow through the contacts.

Example: 24 volts x .100 amps = 2.4 watts

Although maximum recommended current and maximum recommended voltage are both given, the maximum power restriction usually requires limiting the actual values. HSI Sensing specification sheet power ratings are for resistive type loads.

AC and DC loads

Reed switches can operate on AC or DC loads. In general, the AC maximum voltage is approximately 70% of the DC maximum voltage rating. Power and current ratings are equal.

Minimum Switching Power

The minimum recommended power level the contacts need for signal transfer.

Contact Material versus Performance

HSI Sensing manufacturers a variety of contact materials intended to provide optimum performance over a wide variety of applications. A universal contact to cover the broad range of current, voltage, and power levels does not exist. Durel, Rhodium and Tungsten are contact materials that offer benefits to enhance specific applications. See our Application Notes: Plating versus Performance for additional information.

Radio Frequency Loads (RF)

Radio frequency signals travel along the surface of the conductor. HSI Sensing specializes in the manufacturing of reed switches featuring custom plating that enhances RF performance.

Load versus Life

The life expectancy of a reed switch is about a hundred thousand to millions of switching cycles at maximum power. With a low electrical load, the life expectancy can reach half a billion operations. Operation of the reed switch above the maximum electrical ratings of the switch can damage the contacts and reduce the life of the part. Life expectancy can be prolonged with contact protection measures. Selection of proper contact material is imperative for optimal contact performance.

The contact material, wire diameter, internal atmosphere, applied magnetic field, electrical load, and circuit protection (if any) all affect the life of a reed switch. For more information on choosing the right reed switch for your application, contact HSI Sensing.

Types of Electrical Loads

The electrical ratings on HSI Sensing specification sheets are for resistive type loads. Lamps, capacitive and inductive loads tend to be more destructive and may require some form of transient or arc suppression. HSI Sensing has several recommendations to prolong life of the contacts and keep the load within the voltage or current ratings specified. This information is for reference only. Actual contact performance improvement and/or compatibility in the application should be verified.

Resistive Loads

An electrical load not having any significant inrush current; an electrical load in which voltage and current are consistent. When a resistive load is energized, the current rises instantly to its steady-state value, without first rising to a higher value.

Inductive Loads

An electrical load which pulls a large amount of current (an inrush current) when first energized. After a short time the current "settles down" to the full-load running current.

When using reed switches for inductive loads, such as motors, relay coils, solenoids, long signal wires and cables, the contacts will be subjected to high induced voltages during the opening of the contacts. Such high induced voltages may cause damage to the typical reed switch (electro-plated or sputtered contacts) or significantly reduce its life. To withstand these inductive loads HSI Sensing recommends Tungsten contacts. These are available in Form A and Form C switch types.

Depending on the value of the inductance, HSI Sensing recommends contact protection circuits such as RC, resistors or clamping diodes.

Capacitive Loads

An electrical load which closes on a large amount of voltage when first energized.

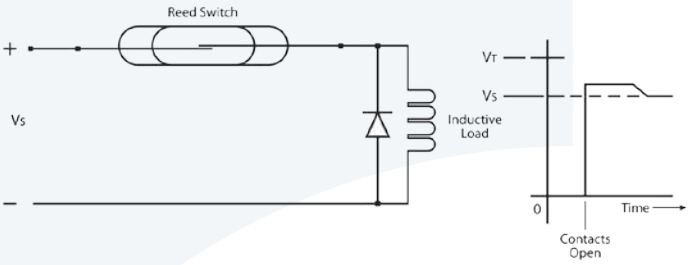
When using reed switches for capacitive loads such as capacitors or long cable runs, the contacts can be subjected to high surge (inrush) current. Therefore, protective circuits such as surge suppressors or current-limiting resistors are recommended.

Basic electrical science formulas

Power = Volts x Amps (P = VA)

Volts = Amps x Resistance (V = IR)

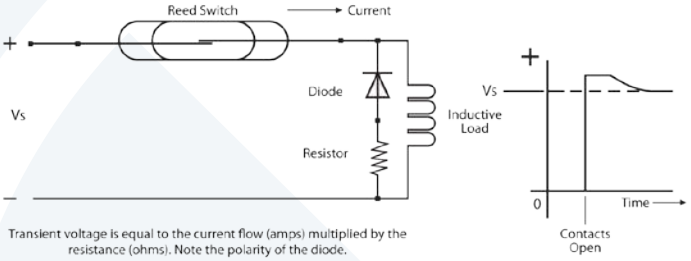
DC Load, Inductive Load, Diode Protection



Vs = Voltage Source

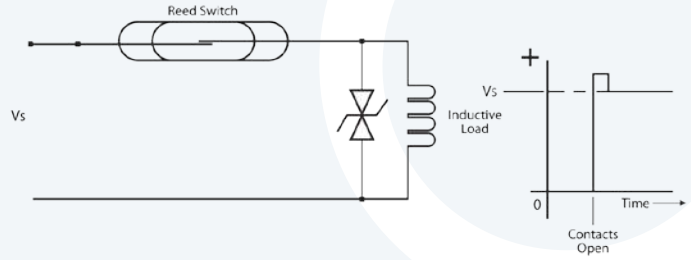
VT = Transient voltage is equal to the forward voltage drop of the diode. Note polarity of the diode.

Inductive Load, Diode-Resistor Protection



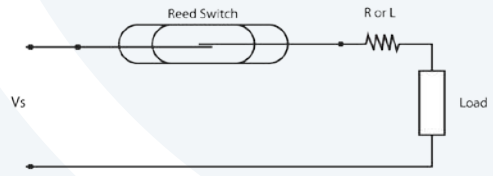
Transient voltage is equal to the current flow (amps) multiplied by the resistance (ohms). Note the polarity of the diode.

Inductive Load, Zender Diode Protection, Featuring Back to Back Zener Diode

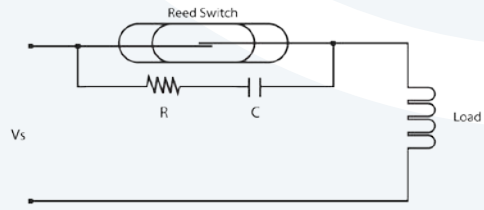


AC or DC Loads

1) Series Resistor or Inductor for capacitive lamp or long cable (or wire) loads



2) Resistor Capacitor Protection for inductive or resistive loads



Capacitor and/or Resistor Value Calculation:

Capacitance

$C = \frac{I^2}{10}$ Value in Micro-farads just prior to contacts opening [I = Amperes of current flowing.]

Voltage = Voltage of source immediately prior to closing to closing contacts.