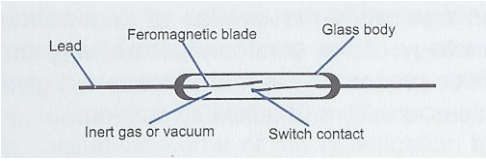
Magnetic Reed Switch Principals of Operation

8/27/2003 - Michael McDonald, General Manager Flair Electronics Inc.

Types of Reed Switches:

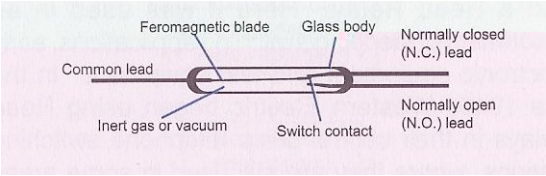
The standard FormA Reed Switch is comprised of 2 ferromagnetic blades encapsulated in a glass tube. The glass tube is hermetically sealed with inert gas. The gas prevents any corrosion or oxidation of the switch contacts. The ferromagnetic blades of the reed switch are spaced slightly apart. The blades act as a conduit for the magnetic field. When an external magnetic field is applied to the switch, the blades will be attracted to one another. When the magnetic field strength is greater than the spring force of the blades the blades will contact, creating a physical and electrical connection between the leads.

Form A Reed



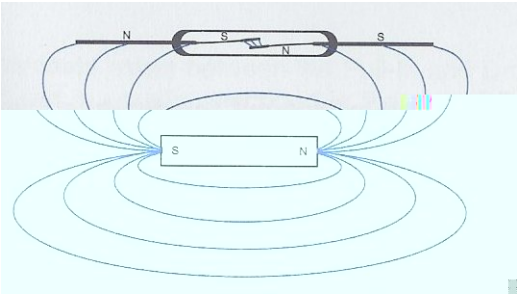
The standard FormC Reed Switch is comprised of 2 ferromagnetic blades with a third non-magnetic blade added to provide for a Normally Closed contact. The ferromagnetic blades of the reed switch are spaced slightly apart, with the third lead in contact with the common lead. When an external magnetic field is applied to the switch, the Common blade will be attracted to the Normally Open (NO) blade. When the magnetic field strength is greater than the spring force of the blade, the blade will contact with the (NO), creating a physical and electrical connection between the leads, while breaking the connection with the Normally Closed blade.

Form C Reed



How Reed switches work with magnets:

Magnets have 2 poles, North & South. The reed switch operates using the potential difference of the magnetic field. If the Reed Switch is surrounded only by a North Pole (N) field the switch will not operate or close. The same is true for only a South Pole (S).
The Reed Switch activates when one blade is (N) and the other blade is (S).

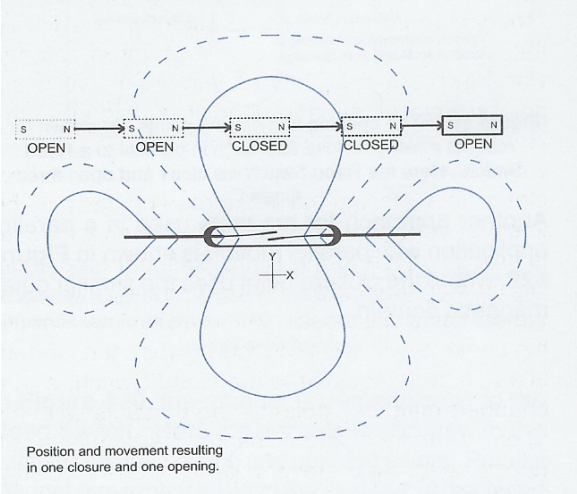


The unit of measure of the magnetic field required to activate a Reed Switch is measured in Ampere Turns (AT). Reed Switches are rated in (AT), Reed Switches have two (AT) ratings. The first is Pull In (PI), the field strength required to close the contacts. The second is Drop Out (DO), the minimum field strength required to hold the contacts closed. It takes less force to hold the contacts closed than it takes to close the contacts. For example, a switch with a (PI) of 10(AT) would have a (DO) of 8(AT). The difference between the (PI) and the (DO) is called the hysteresis.

Magnet orientation:

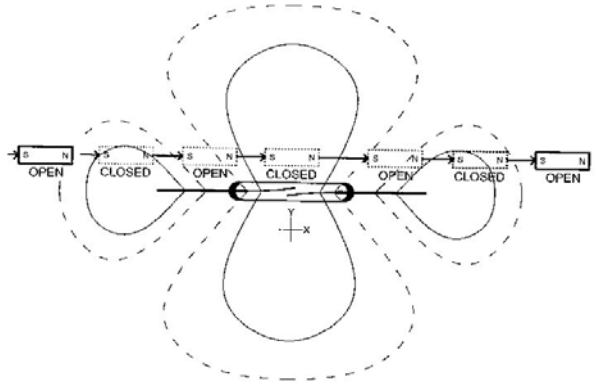
The following diagrams will describe the relationship of the magnet to the reed switch. The curved lines around the Reed Switch illustrate the (PI) and (DO) area of the reed switch. The solid line represents the (PI) and the dotted line represents the (DO). The area between the (PI) and the (DO) is the hysteresis area.

The most common orientation of Reed Switch to Magnet is parallel. This will provide the greatest operating distance (Gap) between switch and magnet. The diagram below illustrates a magnet parallel with the switch passing from left to right. The switch remains open until the magnet passes through the solid (PI) line at which time the switch will close. The switch will remain closed as it passes out of the solid (PI) line into the hysteresis area. The switch will open when it passes out of the hysteresis area past the (DO) line.

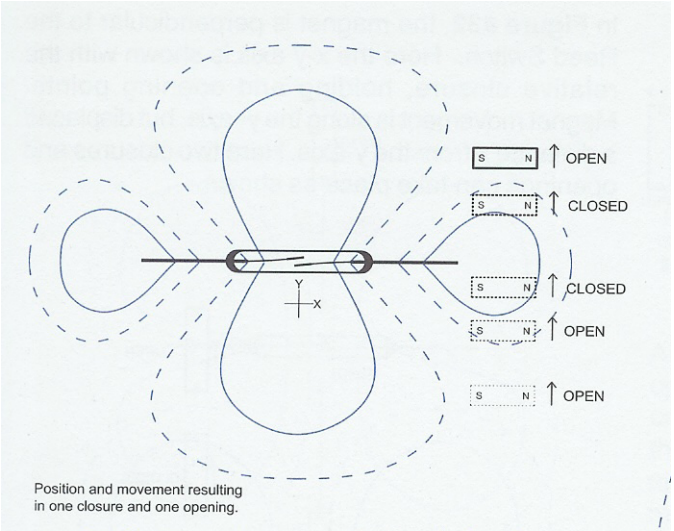


Position and movement resulting in one closure and one opening.

If the magnet is brought closer to the Reed Switch it is possible to have 3 switch points as the magnet passes from left to right, as shown below.

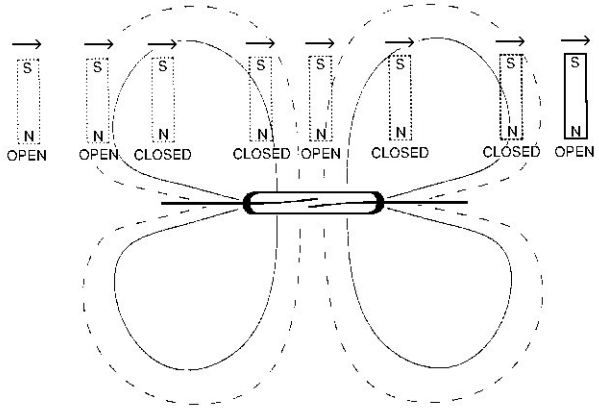


A magnet may also be used at the end of the reed switch as shown below. In this position the Maximum Gap is approximately ½ of the Gap when the Reed and Magnet are Parallel and Centered. This is because only one magnetic field is working upon the Reed Switch. In this case the South Pole of the Magnet.



Position and movement resulting in one closure and one opening.

Another orientation is to have the Switch and Magnet perpendicular. In this orientation the Maximum Gap is also reduced because only one pole of the Magnet is acting upon the Reed Switch.



The following diagrams illustrate that in the perpendicular orientation the Reed Switch will not operate when ever the Switch or Magnet are aligned with the center of either part. This is because the magnet must be in a position to provide a potential difference in the magnetic field surrounding the Reed Switch. If the Reed is aligned with the center of the Magnet or the Magnet aligned with the center of the Reed Switch, there is no potential difference.