SENSING THE WORLD'S NEEDS

The Comus Group of Companies

CONTACT PROTECTION

A reed switch is operated by an externally generated magnetic field. The magnetic field can be applied with a coil or permanent magnet. The operate and release actions of a reed switch are depended on:

- Type of switch
- Dimensions of the reed switch
- Sensitivity (AT) of the reed switch
- Reed switch position to the coil or magnet
- Strength of the Coil (NI)
- Strength of the permanent magnet

Operation Using a Coil

Figures 1, 2 and 3 illustrate the various methods of operating the switch using a coil.
With the method given in Fig. 3, the dry reed switch and/or permanent magnet can be placed either within or outside the coil.

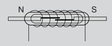


Fig. 1: A dry reed switch mounted within a coil

Fig. 2: A dry reed switch mounted outside a coil

Fig. 3: A dry reed switch biased by a permanent magnet and operated by a coil.

Operation Using a Permanent Magnet

Permanent magnets are also often used to operate dry reed switches. Figures 4, 5, 6, and 7 illustrate the various methods available.

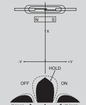


Fig 4: Movement, with the magnetic field parallel to the dry-reed switch

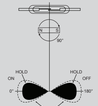


Fig 5: Movement, with the magnetic field perpendicular to the dry-reed switch

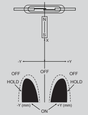


Fig 6: Rotational movement with a bar shaped permanent magnet

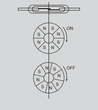


Fig 7: Rotational movement with two or more pole ring magnets

Shielding

Ferromagnetic materials which shunt the magnetic fields may be used to shield a dry-reed switch.
(See Fig: 8)

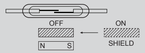


Fig: 8: Shielding a magnetically operated switch

Magnetic Application

There are many applications for dry-reed switches used in combination with a permanent magnet. Figure 9 shows the relationship between the Gauss values of a permanent magnet and the AT values of dry-reed switches in the Philips Standard Coil. It enables the customer to determine which reed switch AT range can be used in combination with a specific permanent magnet.

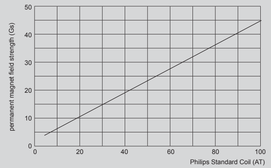


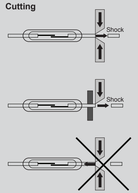
Fig 9: Relationship between the field strength of a permanent magnet and the ampere-turn values of Comus reed switches in the Philips Standard Coil.

CUTTING AND BENDING

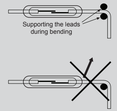
As the reed switch blades are part of the magnetic circuit of a reed switch shortening the leads results in increased pull-in and drop-out values.

When cutting or bending reed switches, it is important that the glass body should not be damaged. Therefore, the cutting or bending point should be no closer than 3mm (0.118) to the glass body.

Cutting



Bending



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We also have a large network of worldwide agents. These can be seen on any of our website.

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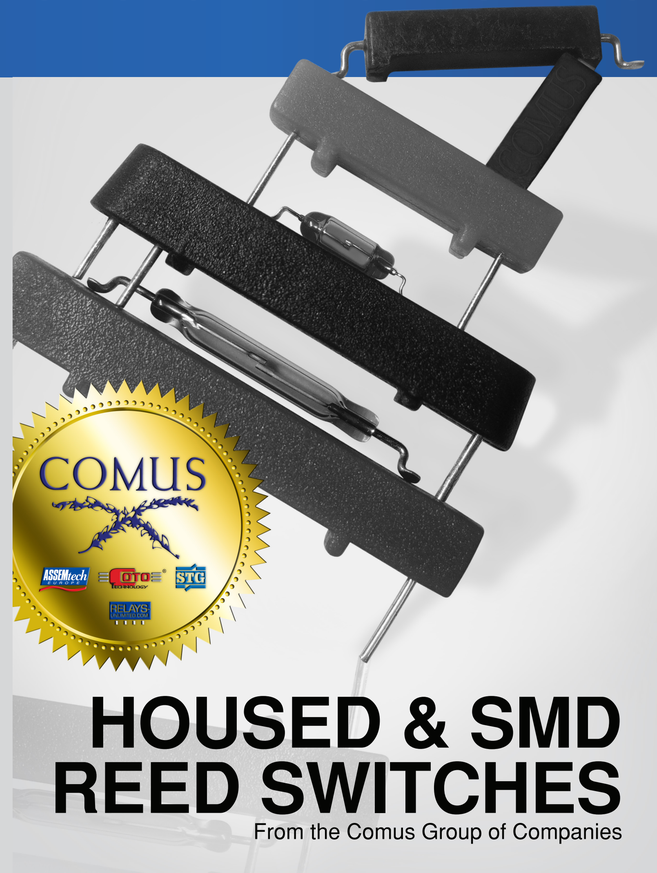


HOUSED & SMD REED SWITCHES

From the Comus Group of Companies

REED SWITCH BASICS

A reed switch is a passive device consisting of two ferromagnetic reed blades hermetically sealed in a glass envelope with an inert gas.

Form A Contact: single pole single throw (SPST) normally open (N.O.) switch.
Form B Contact: single pole single throw (SPST) normally closed (N.C.) switch.
Form C Contact: single pole double throw (SPDT) where a normally closed (N.C.) contact opens before a normally open (N.O.) contact closes. Also called a changeover switch.

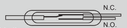
FORM A

Single pole-Single throw
Normally open (SPST N.O.)

FORM B

Single pole-Single throw
Normally closed (SPST N.C.)

FORM C



Single pole-Double throw
(SPDT)

GLOSSARY OF TERMS

Ampere Turn (Sensitivity): is the product of the number of wire turns in an electromagnetic coil winding times the current in amperes passing through the winding. AT is also denoted as NI. test coil N and the current I. A switch with a lower operate AT value will have a higher sensitivity compared to one having a higher Operate AT.

Breakdown Voltage or Dielectric Strength: is the maximum allowable voltage applied between the open contacts without arcing; usually measured in DC Volts or Peak AC.

Contact Resistance: is the electrical resistance of closed contacts measured in milli-ohms with a coil at 25% overdrive (overdrive is the applied voltage or current above the actual closure). Four terminal sensing should be used to insure accurate contact resistance measurements.

Operate Time: the time between when a magnetic field is applied to a reed switch and the first physical closure (does not include bounce time).

Release Time: the time between the removal of the applied magnetic field to the reed switch and the first physical opening of the switch (does not include bounce time).

Bounce: the intermittent opening of a switch after initial closing, or a momentary closing after initial release.

Insulation Resistance: the DC resistance across the open contacts measured in ohms (10^6 MΩ typically)

Life: the life expectancy of a Reed Switch is about 10^8 switching cycles with maximum power. With a low resistive load the life expectancy can reach $5x10^8$ operations. The mechanical life expectancy can reach at least 10^9 operations with no load. Switching inductive, capacitive and lamp loads can considerably reduce the life of a reed switch due to exceeding the specified maximum current.

Test Coil: the relationship of test coil geometry to reed switch under test size can significantly influence the magnetic coupling efficiency resulting in a poor correlation of AT measurements.

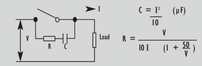
For this reason, good AT measurement correlation relies on the use of standard test coils. The National Association of Relay Manufacturers (NARM) developed standard coils for reed switch sensitivity testing however these coils are only sparsely referenced as most reed switch suppliers use custom proprietary coils to measure AT that rarely correlate well.

Some Comus switches are measured using the Philips Standard Coil. Philips Standard Coil (PSC): 5000 turns of 42 SWG single enameled copper wire on a coil former of 25.4 mm winding length and a core diameter of 8.75 mm.

CONTACT PROTECTION

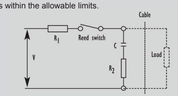
Inductive Loads

A reverse voltage is generated by stored energy in an inductive load when the reed contacts open. This voltage can reach very high levels and is capable of damaging the contacts. An RC network may be used as shown below to give protection.



Capacitive Loads

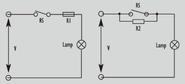
Unlike inductive loads, capacitive and lamp loads are prone to high inrush currents which can lead to faulty operation and even contact welding. When switching charged capacitors (including cable capacitance) a sudden unloading can occur, the intensity of which is determined by the capacity and length of the connecting leads to the switch. This inrush peak can be reduced by a series of resistors. The value is dependent on the particular application but should be as high as possible to ensure that the inrush current is within the allowable limits.



The above diagram illustrates a resistor/capacitor network for protecting a reed switch against high inrush currents. R1 and/or R2 are used depending upo circuit conditions.

Lamp Loads

With lamp load applications it is important to note that cold lamp filaments have a resistance 10 times smaller than already glowing filaments. This means that when being turned on, the lamp filament experiences a current flow 10 times greater than when already glowing. This high inrush current can be reduced to an acceptable level through the use of a series of current-limiting resistors. Another possibility is the parallel switching of a resistor across the switch. This allows just enough current to flow to the filament to keep it warm, yet not enough to make it glow.

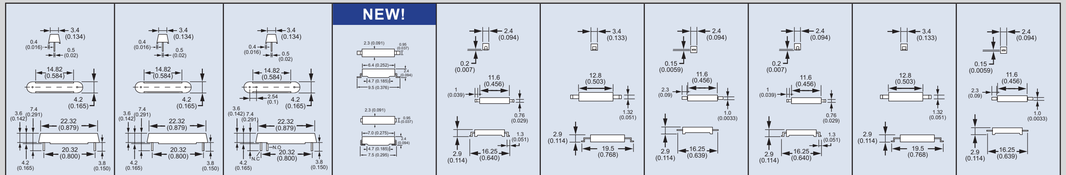


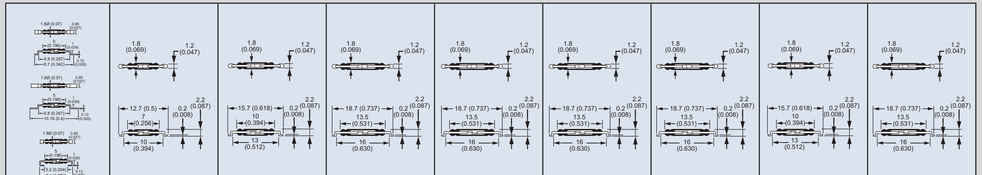
Lamp load with parallel or current limiting resistor across the switch

HOUSED AND SURFACE MOUNT REED SWITCHES

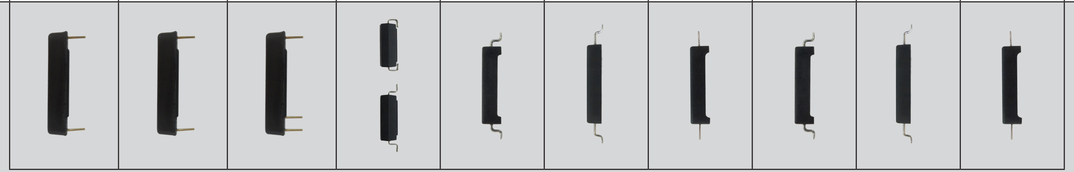
RoHS Compliant

NEW!

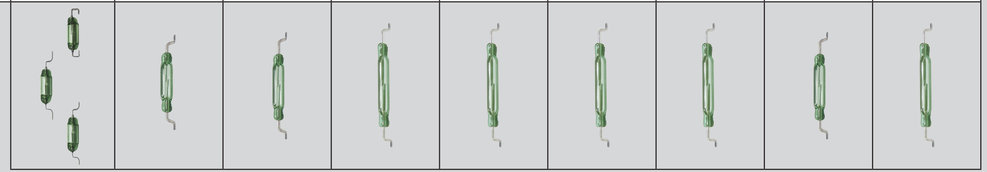




Options / Features			• Change-Over Contacts	• Smallest Available Molded Reed Package	• General Purpose Housed Miniature SMD Reed		• General Purpose Housed Miniature Axial Reed	• Housed Miniature SMD Reed		• Housed Miniature Axial Reed
Contact Form		Normally Open	Normally Closed	Change-Over	Normally Open					
Type		PPS 175A	PPS 175B	PPS 175C	RI-80SMDM	RI-02-90	RI-02-91	RI-02-80	RI-60-90	RI-60-91	RI-60-80
Switching Voltage	Max. VAC	140	125	125	140	140	140	140	140	140	140
Switching Current	Max. A	0.5	0.4	0.4	0.35	0.5	0.5	0.5	0.5	0.5	0.5
Switching Capacity	Max. W/VA	10	5	5	5	10	10	10	10	10	10
Contact Resistance	Max. mOhms	150	140	140	160	150	150	150	125	125	125
Pull in Sensitivity (pre-modification)	AT	7 - 25	15 - 30	15 - 30	5 - 15	7 - 21	7 - 21	7 - 21	7 - 21	7 - 21	7 - 21
Operating Temperature	°C	-40 +125	-40 +125	-40 +125	-40 +125	-40 +125	-40 +125	-40 +125	-40 +125	-40 +125	-40 +125
Storage Temperature	°C	-40 +125	-40 +125	-40 +125	-40 +125	-40 +125	-40 +125	-40 +125	-40 +125	-40 +125	-40 +125
Case Material		ABS	ABS	ABS	Thermoset	ABS	ABS	ABS	ABS	ABS	ABS



Options / Features			• Ultra Miniature SMD Reed	• ATE Ultra Miniature SMD Reed	• Miniature SMD Reed	• High Power SMD Reed	• ATE SMD Reed	• General Purpose SMD Reed	• General Purpose Close Differential SMD Reed	• General Purpose Miniature SMD Reed	• General Purpose SMD Reed
Contact Form			Normally Open								
Type			RI-80SMD	RI-70SMD	RI-60SMD	RI-29SMD	RI-27SMD	RI-07SMD	RI-05SMD	RI-02SMD	RI-01CSMD
Switching Voltage	Max.	VAC	140	140	140	140	140	140	140	140	140
Switching Current	Max.	A	0.35	0.5	0.5	1.0	0.5	0.5	0.4	0.5	0.5
Switching Capacity	Max.	W/VA	5	10	10	20	10	10	10	10	10
Contact Resistance	Max.	mOhms	160	150	125	115	115	130	150	150	150
Pull in Sensitivity (pre-modification)		AT	5 - 15	7 - 21	7 - 21	16 - 34	10 - 34	7 - 36	7 - 25	7 - 21	7 - 25
Operating Temperature		°C	-55 +125	-55 +125	-55 +125	-55 +125	-55 +125	-55 +125	-55 +125	-55 +125	-55 +125
Storage Temperature		°C	-55 +125	-55 +125	-55 +125	-55 +125	-55 +125	-55 +125	-55 +125	-55 +125	-55 +125
Case Material			-	-	-	-	-	-	-	-	-



All dimensions are nominal, in millimetres unless otherwise stated. If further information is required, individual datasheets are available on our websites, and on CD.
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