Actuation of Reed Switches with a Permanent Magnet

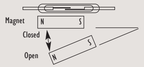
(Examples of switching with the use of a moving magnet.)

Direct Actuation:

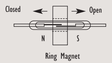
A magnet moved perpendicularly towards and away from a Reed Switch turns it off and on once.

A magnet moved parallel to a Reed Switch operates it from one to three times.

A magnet swung towards and away from a Reed Switch operates it once.



A ring magnet moved parallel to a Reed Switchs' axis operates it from one to three times.



In General:

For all Reed Switches the standard pull-in sensitivity is given in the table.
Other pull-in sensitivities are available on request.

Contact Form A

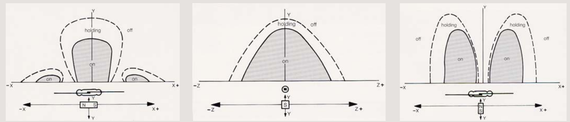
Contact Form B

Magnet Biasing Contact

Contact Form B or C

Normally Closed Contact (Form B)

Normally Open Contact (Form C)

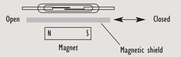


Rotation:

Examples of switching through rotational movement.

Indirect Actuation: Shielding

With the stationary arrangement of a Reed Switch and magnet, the contact Reeds are closed. Should the magnetic field be diverted away from the Reed Switch by a shield of ferro magnetic material placed between the switch and the magnet, the contacts will open. When the shield is removed, the contact Reeds become magnetically actuated and close.



Pull-in Sensitivity:

The given pull-in sensitivity of the Reed Switch has a test equipment tolerance of ± 2 AT.

Life Expectancy:

The life expectancy of a reed switch is dependent upon the load being switched. At maximum rated loads life expectancy is approximately 10^6 switching cycles. Lower load ratings can increase the life expectancy up to $5x10^8$ operations. The mechanical life expectancy can reach at least 10^9 operations. Through the switching of inductive, capacitive, and lamp loads, the life expectancy is considerably reduced due to exceeding the specified maximum current.

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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Reed Switches

DESCRIPTION

Reed Switches consist of two or three ferromagnetic blades (or reeds) hermetically sealed inside a glass envelope. The construction ensures protection from the external environment. Three types are available: Form A (normally open), Form B (normally closed), and Form C (changeover). Form B reed switches are obtained by two methods: By using the normally closed blade of a Form C switch, or, by using a Form A switch, and biasing the contacts closed using a small block magnet. The switch is then able to re-open by the use of another stonger external magnet of opposite polarity. Sensitivity of a reed switch is measured in ampere turns (A.T.) and it should be noted that lower switch (A.T.) ratings are more sensitive as they require less magnetic field strength to operate them. Various voltage and current switching levels are available and contact plating materials can be varied to accommodate specific types of load.

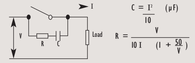
OPERATION

Reed switches are operated by a magnetic field, via a magnet or a current carrying coil. When the field is removed the switch reverts to its previous state.
Operation by a magnet can be achieved in a large variety of ways, either moving the magnet toward and away from the reed either perpendicularly, or parallel to the glass.
Reed switches are used in a variety of Comus Group products including Proximity Switches, Float Switches and Reed Relays. They are also available in moulded packages affording protection from damage and Surface Mount styles.

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.

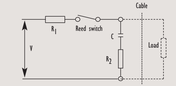


$$C = \frac{I^2}{10} \quad (\mu F)$$

$$R = \frac{V}{10\,I\,\left(1 + \frac{50}{V}\right)}$$

Capacitive Loads

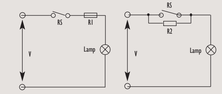
Unlike inductive loads, capacitive and lamp loads are prone to high inrush currents which can lead to faulty operation and even contact welding.
When switching charged capacitors (including cable capacitance) a sudden unloading can occur, the intensity of which is determined by the capacity and length 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. R_1 and/or R_2 are used depending upon circuit condiseos.

Lamp Loads

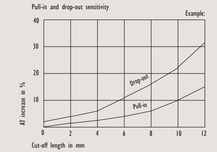
With lamp load applications it is important to note that cold lamp filaments have a resistance 10 times smaller than already glowing filaments. This means that when being turned on, the lamp filament experiences a current flow 10 times greater than when already glowing. This high inrush current can be 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.



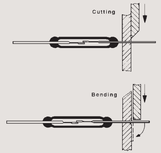
Lamp load with parallel or current limiting resistor across the switch

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(.118) to the glass body.



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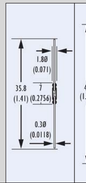
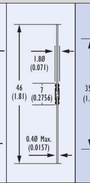
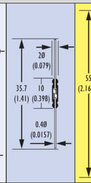
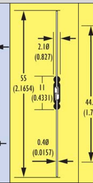
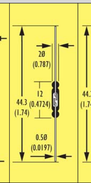
REED SWITCHES

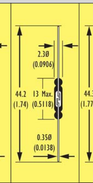


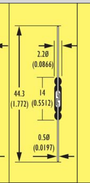


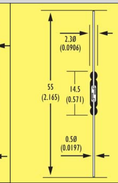


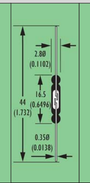


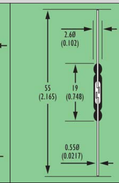


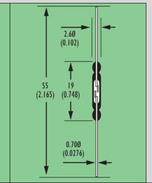


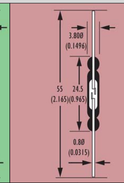


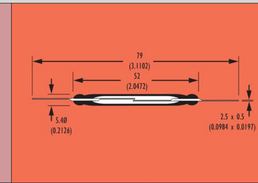


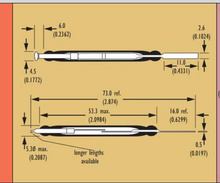


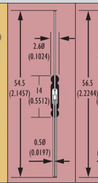


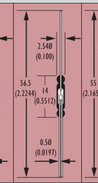


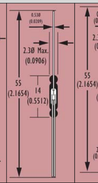


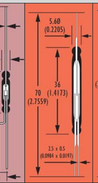


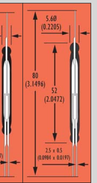












Features	•Smallest Construction •Fastest Switching time	•Smallest Construction •Fastest Switching time	•Small •Construction Fastest Switching time	• General purpose miniature	• Miniature offset	• General purpose miniature	• Lowest pull-in sensitivity • High switching speed • High breakdown voltage	• High Power	• Vacuum High Power	• Close differential type • Low sound	• Stable, low contact resistance • Suitable for dynamic measure	• High Voltage Switching	• High Switching Capacity
Versions	Sub-Micro		Micro	Sub-miniature						Miniature							
Supplier	OKI	Comus	OKI	Comus	OKI	OKI	OKI	Comus	Comus	OKI	OKI	OKI	Comus	Comus	Comus	Comus
Type	ORD213	GC2107	ORD211	GC2522	ORD219	ORD221	ORD228VL	GC2322	GC2314	ORD2210	ORD2210V	ORD2212	GC2722	GC2717	GC3723	GC3717
Contact Form	A	A	A	A	A	A (offset)	A	A	A	A	A	A	A	A	A	A
Contact Material	Rh	Ru	Rh	Rh	Rh	Rh	Rh	Rh	Rh	Rh	Rh	Rh	Rh	Rh	Rh	Rh
Switching Capacity Max. W/VA	1	10	1	6	10	10	10	10	10	DC50W / AC70VA	100	10	12	10	40	40
Switching Voltage Max. VDC/AC	24	70	24	140	100	100	100	150	400	DC200 / AC150	DC350 / AC300	DC100 / AC100	230	500	230	400
Switching Current Max. A	0.1	0.3	0.1	0.5	0.5	0.3	0.5	0.5	0.5	DC1.0 / AC0.7	DC1.0	DC0.2	1.0	0.5	2.0	2.0
Carry Current Max. A	0.3	1.0	0.3	0.8	1.0	1.0	1.0	1.0	1.0	2.5	2.5	0.5	2.0	1.0	3.0	3.0
Breakdown Voltage Min. VDC	150	150	150	200	150	150	150	200	600	250min.(PI≥20)	1000min.	150	400	1300	400	1000
Contact Resistance Max. mOhms	200	200	100	150	100	100	150	150	150	100	100	100	100	100	80	80
Insulation Resistance Min. Ohms	10^9	10^{10}	10^9	10^{10}	10^9	10^9	10^9	10^{10}	10^{11}	10^{10}	10^{10}	10^9	10^{11}	10^{11}	10^{11}	10^{11}
Pull-in Sensitivity AT	10 - 40	10 - 30	10 - 40	10 - 40	10 - 30	10 - 30	10 - 50	10 - 35	10 - 35	15 - 60	20 - 60	15 - 45	30 - 50	30 - 50	30 - 50	30 - 50
Drop-out Sensitivity Min. AT	5	5	5	5	5	5	5	5	5	7	7	DO/PI>0.8(PI≥20	5	5	15	15
Operate Time Max. ms	0.3	0.3	0.3	1.0	0.4	0.4	0.4	1.8	1.8	0.6	0.6	0.4	2.0	2.0	2.0	2.0
Bounce Time Max. ms	0.3	0.05	0.3	0.3	0.3	0.5	0.3	0.2	0.2	0.5	0.5	1.0	0.5	0.5	0.5	0.5
Release Time Max. ms	0.05	0.10	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.10	0.10	0.10	0.10
Resonant Frequency Typ. Hz	11000	7500	7500	6000	5900	2750	5000	5000	5000	2500	2500	3900	2900	2900	4200	4200
Operating Frequency Max. Hz	500	500	500	400	500	500	500	200	200	500	500	500	200	200	300	300
Vibration (10-1000Hz) g	20	30	20	35	20	20	20	35	35	20	20	20	35	35	35	35
Shock (11ms) g	30	50	30	50	30	30	30	50	50	30	30	30	50	50	50	50
Capacitance Typ. pF	0.4	0.2	0.2	0.5	0.3	0.3	0.3	0.7	0.7	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Operating Temp. Range Deg. °C	-40 +125	-40 + 125	-40 +125	-40 +125	-40 +125	-40 +125	-40 +125	-40 +125	-40 +125	-40 + 125	-40 + 125	-40 + 125	-40 + 125	-40 + 125	-40 + 125	-40 + 125
Test Coil Type	0211	0211	0211	1035	0221	0221	0221	1035	1035	0229	0229	0221	1700	1700	1700	1700

Features	High Breakdown voltage	•High Switching current	•High Switching current High Breakdown voltage	•High Breakdown voltage •High Switching capacity	•High Breakdown voltage	•High Switching capacity	• General purpose reed switch	• High Switching current • High Breakdown voltage • Vacuum Technology			• Economical change-over switches		• High capacity/size ratio		• High Switching capacity • High Breakdown voltage	• High Switching capacity
Versions	Miniature	Compact		Standard				High-Voltage			Compact				Standard	
Supplier	OKI	Comus	Comus	Comus	Comus	Comus	Comus	Comus	Comus	Comus	Comus	OKI	Comus	Comus	Comus	Comus
Type	ORD229	GC3823	GC3817	GC1513	GC1517	GC1523	GC1525	HBS-7KVDC	HBS-10KVDC	HBS-15KVDC	GC3525	ORT551	GC3336	GC3436	GC1917	GC1625
Contact Form	A	A	A	A	A	A	A	A	A	A	C	C	C	C	C	C
Contact Material	Rh	Rh	Rh	Rh	Rh	Rh	Rh	W	W	W	Rh	Rh	Rh	Rh	Rh	Rh
Switching Capacity Max. W/VA	DC50 / AC70	60	60	120	30	120	80	50	50	50	5	3	20	20	60	60
Switching Voltage Max. VDC/AC	DC350 / AC300	230	400	1500	1500	250	250	5000	7500	10000	100	30	150	150	400	230
Switching Current Max. A	DC0.7 / AC0.5	3.0	3.0	3.0	1.0	3.0	1.3	3.0	3.0	3.0	0.5	0.2	1.0	1.0	1.0	1.0
Carry Current Max. A	2.5	4.0	4.0	5.0	2.0	5.0	2.0	5.0	5.0	5.0	1.0	0.5	2.0	2.0	2.0	2.0
Breakdown Voltage Min. VDC	500	400	1000	3000	3000	800	800	7000	10000	15000	200	200min.(PI≥20)	200	200	1000	400
Contact Resistance Max. mOhms	100	80	80	80	80	80	80	100	100	100	150	100	150	150	100	100
Insulation Resistance Min. Ohms	10^{10}	10^{11}	10^{11}	10^{11}	10^{11}	10^{11}	10^{11}	10^{10}	10^{10}	10^{10}	10^9	10^9	10^9	10^9	10^9	10^9
Pull-in Sensitivity AT	20 - 60	30 - 70	30 - 70	75 - 95	75 - 95	75 - 95	75 - 95	90 - 170	90 - 200	120 - 200	15 - 50	10 - 30	15 - 30	15 - 30	50 - 80	80 - 120
Drop-out Sensitivity Min. AT	6	15	15	30	25	30	25	40	40	40	8	4	5	5	20	20
Operate Time Max. ms	0.6	2.5	2.5	3.5	3.5	3.5	3.5	1.8	1.8	1.8	1.5	1.0	2.0	2.0	4.0	4.0
Bounce Time Max. ms	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.8	1.8	1.8	0.6	1.5	0.6	0.6	0.5	0.5
Release Time Max. ms	0.05	-	0.10	0.2	0.2	0.2	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.15	0.10
Resonant Frequency Typ. Hz	2500	2400	2400	900	900	900	900	-	-	-	-	6000	-	-	-	-
Operating Frequency Max. Hz	500	200	200	100	100	100	100	5	5	5	250	200	250	250	100	100
Vibration (10-1000Hz) g	20	35	35	35	35	35	35	35	35	35	35	20	20	20	35	35
Shock (11ms) g	30	50	50	50	50	50	50	40	40	40	50	30	50	50	50	50
Capacitance Typ. pF	0.5	0.5	0.5	0.8	0.8	0.8	0.8	0.5	0.5	0.5	1.5	1.5	0.8	0.8	1.0	1.0
Operating Temp. Range Deg. °C	-40 + 125	-40 + 125	-40 + 125	-40 + 125	-40 + 125	-40 + 125	-40 + 125	-55 + 125	-55 + 125	-55 + 125	-40 + 125	-40 + 125	-40 + 125	-40 + 125	-40 + 125	-40 + 125
Test Coil Type	0229	1800	1800	1500	1500	1500	1500	NARM RS-421-A-III or EN 119000 No.16	NARM RS-421-A-III or EN 119000 No.16	NARM RS-421-A-III or EN 119000 No.16	1035	0551	1035	1035	1500	1500