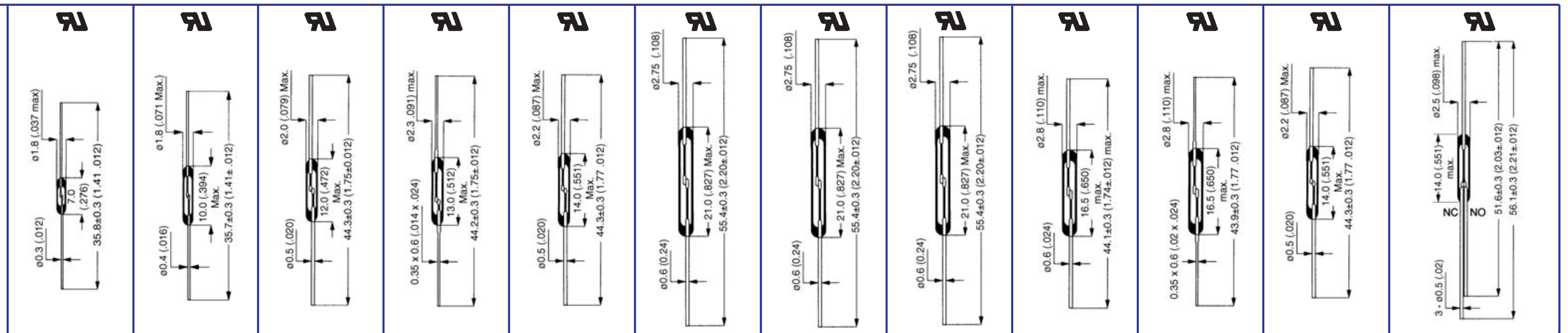


			ORD213	ORD211	ORD219	ORD221	ORD228VL	ORD229	ORD2210	ORD2210V	ORD2211	ORD2212	ORD9216	ORT551	
Electrical	Contact		1A	1A	1A	1A (offset)	1A	1A	1A	1A	1A	1A	1A	1C	
Characteristics	Pull-in	AT	10 ~ 40	10 ~ 40	10 ~ 30	10 ~ 30	10 ~ 50	20 ~ 60	15 ~ 60	20 ~ 60	20 ~ 60	15 ~ 45	10 ~ 50	10 ~ 30	1
	Drop-out	AT	5 min.	5 min.	5 min.	5 min.	5 min.	6 min.	7 min.	7 min.	8 min.	DO/PI>0.8(PI≥20)	5 min.	4 min.	1
	Contact Resistance (Initial)	mΩ	200 max.	100 max.	100 max.	100 max.	100 max.	100 max.	100 max.	100 max.	100 max.	100 max.	100 max.	100 max.	2
	Breakdown Voltage	DCV	150 min.	150 min.	200 min.(PI≥20)	200 min.(PI≥20)	200 min.(PI≥20)	600 min.(PI≥35)	250 min.(PI≥20)	1000 min.	200 min.(PI≥20)	150 min.	200 min.(PI≥20)	200 min.(PI≥20)	3
	Insulation Resistance	Ω	10^9 min.	10^9 min.	10^9 min.	10^9 min.	10^9 min.	10^{10} min.	10^{10} min.	10^{11} min.	10^9 min.	10^9 min.	10^9 min.	10^9 min.	4
	Electrostatic Capacitance	pF	0.4 max.	0.2 max.	0.3 max.	0.3 max.	0.3 max.	0.5 max.	0.5 max.	0.5 max.	0.3 max.	0.5 max.	0.3 max.	1.5 max.	5
	Contact Rating	VA, W	1.0	1.0	10	10	10	AC70VA/DC50W	AC70VA/DC50W	100	50 (12V-3.4W lamp	10	10	3	
	Maximum Switching Voltage	V	AC24 / DC24	AC24 / DC24	AC100 / DC100	AC100 / DC100	AC100 / DC100	AC300 / DC350	AC150 / DC200	AC300 / DC350	AC100 / DC100	AC100 / DC100	AC100 / DC100	AC30 / DC30	
	Maximum Switching Current	A	DC 0.1	DC 0.1	DC 0.5	DC 0.3	DC 0.5	AC 0.5 / DC 0.7	AC 0.7 / DC 1.0	DC 2.5	0.5 In rush 3A	DC 0.2	DC 0.5	DC 0.2	
	Maximun Carry Current	A	0.3	0.3	1.0	1.0	1.0	2.5	2.5	2.5	2.5	0.5	1.0	0.5	6
Operating	Operate Time	ms	0.3 max.	0.3 max.	0.4 max.	0.4 max.	0.4 max.	0.6 max.	0.6 max.	0.6 max.	0.6 max.	0.4 max.	0.4 max.	1.0 max.	7
Characteristics	Bounce Time	ms	0.3 max.	0.3 max.	0.3 max.	0.5 max.	0.3 max.	0.5 max.	0.5 max.	0.5 max.	0.4 max.	1.0 max.	0.3 max	N.C. 1.5 max N.O. 1.0 max.	8
	Release Time	ms	0.05 max.	0.05 max.	0.05 max.	0.05 max.	0.05 max.	0.05 max.	0.05 max.	0.05 max.	0.05 max.	0.05 max.	0.05 max.	0.5 max.	9
	Resonant Frequency	Hz	1100 ± 2000	7500 ± 500	5900 ± 400	2750 ± 250	5000 ± 400	2500 ± 250	2500 ± 250	2500 ± 250	4600 ± 500	3900 ± 500	5000 ± 100	6000 ± 4000	10
	Maximum Operating Frequency	Hz	500	500	500	500	500	500	500	500	500	500	500	200	11
Standard Coil	Coil Resistance	Ω	600	600	450	450	450	500	500	500	450	450	450	500	
	No. of Turns	T	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	
	Dimensions	mm	3.3ø x 10	3.3ø x 10	3.7ø x 15	3.7ø x 15	3.7ø x 15	4.6ø x 21	4.6ø x 21	4.6ø x 21	3.7ø x 15	3.7ø x 15	3.7ø x 15	4.6ø x 10	12
	Type No.		8	8	6	6	6	3	3	3	6	6	6	10	
Features (Contact Material)			Super Ultra-miniature (Rh)	Ultraminiature (Rh)	General purpose miniature (Rh)	Miniature offset (Rh)	General purpose miniature (Rh)	High breakdown voltage (Rh)	High power (Rh)	Vacuum High power (Rh)	Lamp Load (Rh)	Closed differential type Low sound (Rh)	General Purpose miniature (Rh)	Ultra Miniature trans-fer (Rh)	Table 1

NOTES

1 Pull-in and drop-out were measured by using our standard coil.
*This value of drop-out is prescribed when pull-in is over 20AT.
When pull-in is less than 20AT, drop-out are 5 MIN and Do/OP> 0.7.
Tolerance at measurement is ±2AT. (Fig 1)

2 Measurement are made by the four terminal voltage reduction method where the 100AT excitation is given to the switch using our standard coil to close the contacts, and 10 mA current is applied.

3 This value varies depending on the pull-in value (contact gap). In this measurement, the pull-in value is about 20AT. (MIL-STD-202F METHOD 301).

4 Measurement is made by using a DC 100 V super megger. (MIL-STD-202F MET-HOD 302).

5 The values show those at 1 MHz.

6 The value is obtained from the dry test under continuous current flow.

7 The value shows the time required for the contacts to cause the first contact bounce after applying the voltage to our standard test coil. The time is shown at Top in Fig. 2. Fig. 4 shows the relationship between operate time and pull-in.

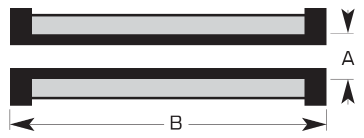
8 Bouncing is caused when the contacts close. Bounce time means the time when opening and closing of the contacts are being repeated before the contacts are completely closed. Shown by Tbounce.

9 Release time means the time from the moment the voltage applied to the test coil is removed to the moment the contacts open. Shown by Tris.

10 Resonant frequency is a vibrating frequency inherent to the reed switch. Avoid application of vibration at this frequency to the switch, otherwise it will cause misoperation.

11 The reed switch can be operated with a frequency higher than the maximum operating frequency. However, operation with such a frequency will often cause an endless chattering at the time of ON operation. It is recommended for the designer to take the maximum operating frequency into consideration when designing systems and circuits.

12 Dimensions of standard coil.



A: Inner diameter of standard coil.
B: Length of standard coil.

Fig. 1

Test Procedures (1)
for pull-in, drop-out and contact resistance

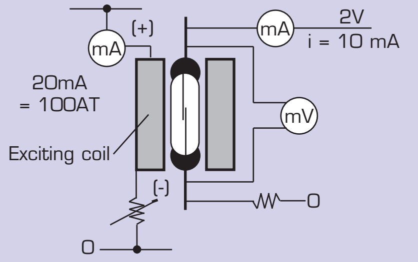
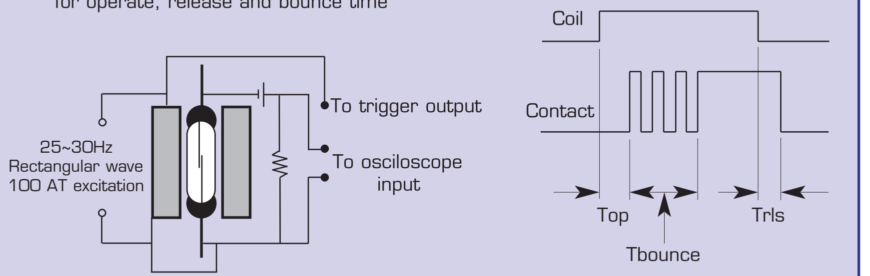


Fig. 2

Test Procedures (2)
for operate, release and bounce time



Environmental Characteristics Table 2

	Charasteristics (Common to All Types)	Test Conditions	Notes
Shock	Shall not misoperate with shock of 30G (11 msec) applied	MIL-STD-202F METHOD 213B	13
Vibration	Shall not misoperate with max. 20G (10 - 1000Hz)	MIL-STD-202F METHOD 204D	14
Temperature range	Shall be operational in the range of -40 to 125°C	MIL-STD-202F METHOD 107D	15
Lead Tensile Strength	Shall withstand against 2 kg static load.	MIL-STD-202F METHOD 211A	16

13 If a shock of more than 30G is applied to a reed switch, the pull-in value of the switch will be often caused to change from the standard specification. Therefore, it is recommended not to use the reed switch which have been given such a shock.

14 If a vibration of more the 1 kHz is applied to a reed switch, even a very small acceleration to it will easily cause the switch to misoperate to close due to its resonant frequency. (See Fig. 5).

15 In practice the reed switch can operate beyond the specified range. In case of magnet driving, however, some magnets show decrease of magnetic flux even at the lowest temperature of the range depending on their temperature characteristics. Therefore, it is recommended to consider the range as a general guide line.

16 The actual tensile strength is more than 5 kg (breakdown). However, considering the lead not to get out of position, the value for the static load is shown here.

17 UL recognition number is E70063.

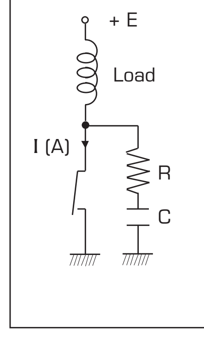
COMUS

Contact Protection Circuit

When a reed switch is to be connected to the inductive load or the load where surge current or rush current flows (such as capacitance load, lamp, long cable, etc) the following contact protection circuits are also required for the reed switch.

Inductive Load
In case an electromagnetic relay, electromagnetic solenoid, or electromagnetic counter which has inductive component is provided as a load in a circuit, the energy stored in the inductance will cause an inverse voltage when the reed contacts break. The voltage, although dependent on the inductance value, sometimes reaches as high as several hundred volts and becomes a major factor to deteriorate the contacts. In order to prevent this, many protection circuits are provided, typical examples of which are shown in Fig. 26.

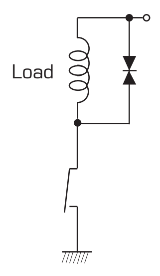
Fig. 26



a) Contact protection with CR (connection to load terminal also allowed)

$$C = \frac{I^2}{10}\,[\mu F]$$

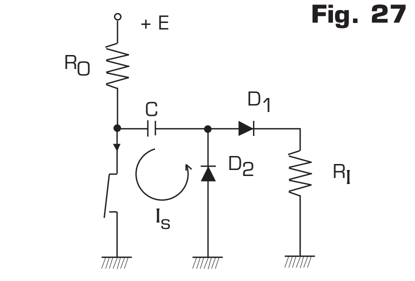
$$R = \frac{E}{10\,I\,(1 + E/50)}\,\Omega$$



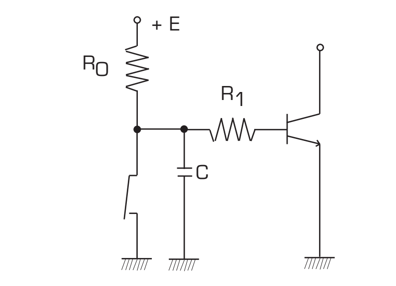
b) Contact protection with varistor (connection to contact lead also allowed) In case the open state of the contacts continues for relatively long time, the protection circuit should be connected to the terminal.

Capacitance Load
In case a capacitor is provided in series or in parallel with the reed switch contacts in a closed circuit, the rush current which flows at the time of charge and discharge of the capacitance will cause much deterioration of the reed contacts. Fig. 27. shows typical examples of the protection circuits to prevent the rush current.

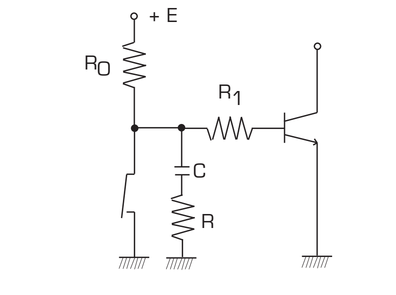
Fig. 27



a) Differential circuit without contact protection.
The energy stored in C will cause the rush current (Is) when the contacts close.



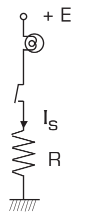
b) Circuit with C for chattering protection. The rush current will also be caused as in the circuit a).



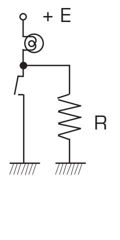
b) Circuit with R for contact protection.
R = 50 ~ 500 [Ω].

Lamp Load (except ORD211 for 3.4W lamp load)
In case of the lamp load, a tumgstem filament lamp is generally used. The tungsten filament lamp features that its resistance is small immediately before it is switched on and will become larger after switched on, followed by lighting with steady-state current. If the reed switch is used for switching in this lamp circuit, the rush current (5 to 10 times the steady-state current) will flow in the contacts immediately after the lamp being turned on, and often cause melting or sticking of the reed contacts. The circuit with a lamp load is, therefore, considered similar to a circuit with a capacitor where large current flows to charge the capacitor, thus requiring the contact protection circuit. Fig. 28 shows examples of protection circuits.

Fig. 28



R = Current-limiting resistor
R should be decided so that I_S <0.5A can be obtained



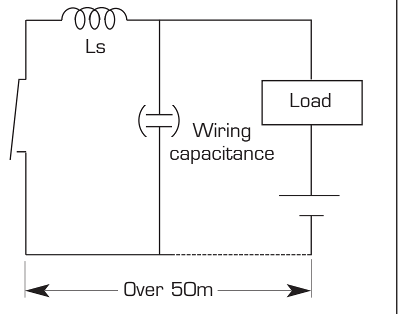
R = Parallel resistance
By connecting R, the filament is heated and its resistance is made higher.

$$R < \frac{\text{Filament resistance}}{3}$$

Wiring Capacitance
In case the reed switch is connected to the load by cable over a long distance, static capacitance caused by the cable will affect the contact characteristic of the reed switch. Although it depends on type of cable,it is recommended that, if the cable length exceeds 50 meters, the user provide a protection curcuit as shown in Fig. 29 for the longer operating life of the reed switch.

The surge suppressor (Ls) inserted near the reed switch contacts makes the rush current flowing to the contacts to be delayed. The value of Ls is 0.5 to 5 mH depending on the load current. The Ls can be replaced by a very small resistance (current-limiting resistor) of 10 to 500Ω

Fig. 29



Cutting or Bending of Leads

Since the leads of a reed switch comprise part of the magnetic circuit, shortening the leads by cutting will cause the required ampere turns for pull-in and drop-out to increase as shown in Fig. 24. when bending the leads, make sure that the portion nearest to the glass tube is gripped tightly by a jig as shown in Fig. 25, so that application of a mechanical stress does not damage the sealed portion. When the leads are to be cut shorter or bent, the user must make sure that the cutting or bending should take place at a point 4 millimeters (.120in) or further away from the sealed portion of the leads and the glass tube.

Fig. 24

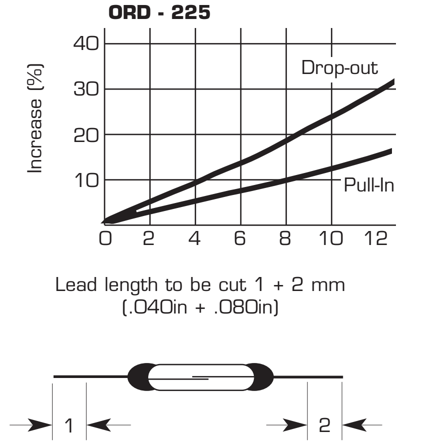


Fig. 25