
Preface

We would like to thank you for being a loyal user of our reed switch products. In the rapidly developing electronics industry, reed switch products span a wide field of application that demand not only performance and function but also compact size and high reliability.

To meet these demands, we have developed a broad range of high-performance and high-reliability reed switches that find application in numerous fields.

This Databook provides all the necessary reed switch specifications and we hope it will stand you in good stead.

Utilizing the latest high technology, it is our firm commitment to contribute to the development of the electronics industry and would like to solicit your guidance and support in helping us reach this goal.

December 2007

Oki Sensor Device Corporation

NOTICE

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2. When designing your product, please use within the guaranteed ranges for electrical characteristics, environmental characteristics, operating characteristics and lifetime characteristics etc. Please be aware that our company assumes no responsibility for results attributable to use outside the guaranteed ranges, or other mistaken or improper use of the product.
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REED SWITCH

Data book

2007

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REED SWITCH

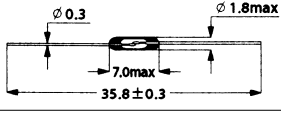
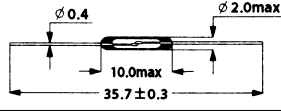
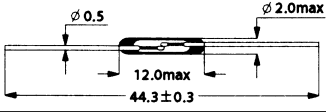
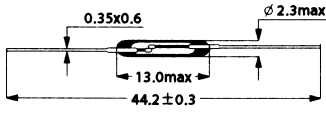
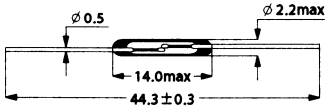
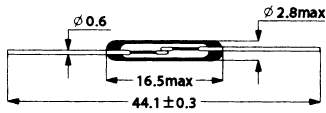
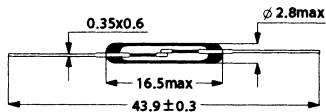
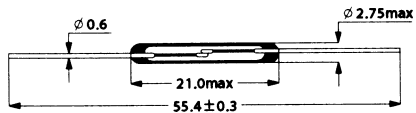
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INTRODUCTION	GENERAL DESCRIPTION, RELIABILITY, PRECAUTIONS, DESCRIPTION OF SYMBOLS AND TERMS
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REED SWITCH TYPICAL CHARACTERISTICS ●

Part No.	ORD213 1A		ORD219 1A		ORD221 1A (OFF-SET)		ORD228VL 1A		ORD2211 1A		ORD2212 1A		ORD229 1A		ORD2210 1A		ORD2210V 1A		
	Contact form	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	
Electrical Characteristics	Pull-in [AT]	10 ~ 40	10 ~ 30	10 ~ 50	20 ~ 60	15 ~ 45	15 ~ 60	20 ~ 60	15 ~ 60	15 ~ 60	15 ~ 60	15 ~ 60	20 ~ 60	20 ~ 60	15 ~ 60	20 ~ 60	20 ~ 60	20 ~ 60	
	Drop-out [AT]	5min	5min	5min	5min	8min	5min	5min	8min	8min	100max	100max	60min	100max	7min	100max	100max	100max	
	Contact resistance [initial] [mΩ]	100max	100max	100max	100max	100max	100max	100max	100max	100max	100max	100max	100max	100max	100max	100max	100max	100max	100max
	Breakdown voltage [DCV]	150min	150min	200min (PI ≥ 20)	200min (PI ≥ 20)	200min (PI ≥ 20)	200min (PI ≥ 20)	200min (PI ≥ 20)	200min (PI ≥ 20)	200min (PI ≥ 20)	200min (PI ≥ 20)	150min	150min	600min (PI ≥ 3.5)	2.50min (PI ≥ 20)	2.50min (PI ≥ 20)	2.50min (PI ≥ 20)	2.50min (PI ≥ 20)	2.50min (PI ≥ 20)
	Insulation resistance [Ω]	10 ¹⁰ min	10 ¹⁰ min	10 ¹⁰ min	10 ¹⁰ min	10 ¹⁰ min	10 ¹⁰ min	10 ¹⁰ min	10 ¹⁰ min	10 ¹⁰ min	10 ¹⁰ min	10 ¹⁰ min	10 ¹⁰ min	10 ¹⁰ min	10 ¹⁰ min	10 ¹⁰ min	10 ¹⁰ min	10 ¹⁰ min	10 ¹⁰ min
	Electrostatic capacitance [pF]	0.4max	0.2max	0.3max	0.3max	0.3max	0.3max	0.3max	0.3max	0.3max	0.3max	0.3max	0.3max	0.3max	0.3max	0.3max	0.3max	0.3max	0.3max
	Contact rating [VA, W]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Maximum switching current [A]	DC0.1	DC0.1	DC0.5	DC0.5	DC0.3	DC0.3	DC0.5	DC0.5	DC0.5	DC0.5	DC0.2	DC0.2	DC0.7/AC0.5	DC1.0/AC0.7	DC1.0	DC1.0	DC1.0	DC1.0
	Maximum carry current [A]	0.3	0.3	1.0	1.0	0.4max	0.4max	1.0	1.0	2.5	2.5	0.5	0.5	2.5	2.5	2.5	2.5	2.5	2.5
	Operate time [ms]	0.3max	0.3max	0.4max	0.4max	0.4max	0.4max	0.4max	0.4max	0.6max	0.6max	0.4max	0.4max	0.6max	0.6max	0.6max	0.6max	0.6max	0.6max
Bounce time [ms]	0.3max	0.3max	0.3max	0.3max	0.3max	0.3max	0.3max	0.3max	0.4max	0.4max	1.0max	1.0max	0.5max	0.5max	0.5max	0.5max	0.5max	0.5max	
Release time [ms]	0.05max	0.05max	0.05max	0.05max	0.05max	0.05max	0.05max	0.05max	0.05max	0.05max	0.05max	0.05max	0.05max	0.05max	0.05max	0.05max	0.05max	0.05max	
Resonant frequency [Hz]	11000 ± 2000	7500 ± 500	5900 ± 400	2750 ± 250	5000 ± 400	5000 ± 400	5000 ± 400	5000 ± 400	4600 ± 500	3900 ± 500	2500 ± 250	2500 ± 250	2500 ± 250	2500 ± 250	2500 ± 250	2500 ± 250	2500 ± 250	2500 ± 250	
Minimum operating frequency [Hz]	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	
Coil resistance [Ω]	600	600	450	450	5000	5000	5000	5000	450	450	5000	5000	5000	5000	5000	5000	5000	5000	
Number of turns	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	
Standard coil Dimension [mm]	φ 3.3 × 10	φ 3.3 × 10	φ 3.7 × 15	φ 3.7 × 15	φ 3.7 × 15	φ 3.7 × 15	φ 3.7 × 15	φ 3.7 × 15	φ 3.7 × 15	φ 3.7 × 15	φ 3.7 × 15	φ 3.7 × 15	φ 4.6 × 21	φ 4.6 × 21	φ 4.6 × 21	φ 4.6 × 21	φ 4.6 × 21	φ 4.6 × 21	
Part No.	[SNo.]	8	6	6	6	6	6	6	6	6	6	6	3	3	3	3	3	3	
Operating Temperature Range		-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C	-40°C ~ +125°C	
Features (Contact material)		Ultra-miniature (Rh)	Miniature high-performance (Rh)	Miniature high-performance (Rh)	Miniature offset-type (Rh)	Miniature offset-type (Rh)	Miniature high-performance (Rh)	Lamp load (Rh)	Closed differential type: Low sound (Rh)	High breakdown voltage (Rh)	High breakdown voltage (Rh)	High power (Rh)	Vacuum High power (Rh)						
Page		47	39	55	63	71	79	87	95	103	111								



Environmental Characteristics

Environmental conditions are the same for all models of reed switches.

	Characteristics	Test methods	Remarks
Shock Resistance	No malfunction or change in characteristics when subjected to shock of 294 m/s ² (11 m sec).	MIL-STD-202G METHOD213B condition J	1
Vibration Resistance	No malfunction or change in characteristics when subjected to vibration of less than 196 m/s ² (10 to 2000 Hz).	JMIL-STD-202G METHOD204D condition D	2
Operating Temperature Range	Operating Temperature-40 to 125°C.	—	3
Lead tensile strength	Withstand static load of 22.2 N in tension.	MIL-STD-202G METHOD 211A	

- Remark
1. When subjected to shock above 294 m/s², reed switch pull-in value may change.
 2. When reed switches are exposed to vibrations close to the resonant frequency, even minute accelerations may cause the opening or closing operation to malfunction.
 3. Reed switches can be operated beyond this temperature range if certain evaluation is done. It is noted that Magnets increase magnetization at low temperatures.

The UL recognition number for our reed switches is E70063.

Our reed switches comply with the ELV Directive (2000/53/EC) and the RoHS Directive (2002/95/EC).

1

GENERAL DESCRIPTION

The reed switch was invented by Dr. W. B. Ellwood at Bell Telephone Laboratories in 1936. The first application was made during 1938 when the reed switch was used as a selector switch in coaxial carrier equipment. Later, improvements of the reed switches were made in parallel with the development of the telecommunications technology. At the same time, the advantages of reed switches such as the speedy response time, hermetically sealed contacts, compact size and long mechanical life have contributed greatly to the development of telecommunications technology.

From 1956, when research and development on reed switches began in Japan, innovations have been made in improving contact performance, reducing overall size, improving manufacturing methods and reducing manufacturing cost. In addition to applications in switching systems, broad applications have been developed as sensors and controllers in automobile electrical devices, reed relays, and other instruments of various types.

Our reed switches of extremely superior quality are manufactured based on our own original technology for deactivating contact surfaces, high performance automatic sealing equipment and contact resistance measurement technology which uses magnetic flux scanning tests (FS method). In particular, our process for deactivating contact surfaces takes the fatal problem of the conventional rhodium contact reed switch and suppresses increases in contact resistance due to organic

contamination. Thus, it became possible to manufacture reed switches with stabilized contact resistance. This original technology was awarded the highest award (Schneider Award) at the 21st Annual National Relay Conference.

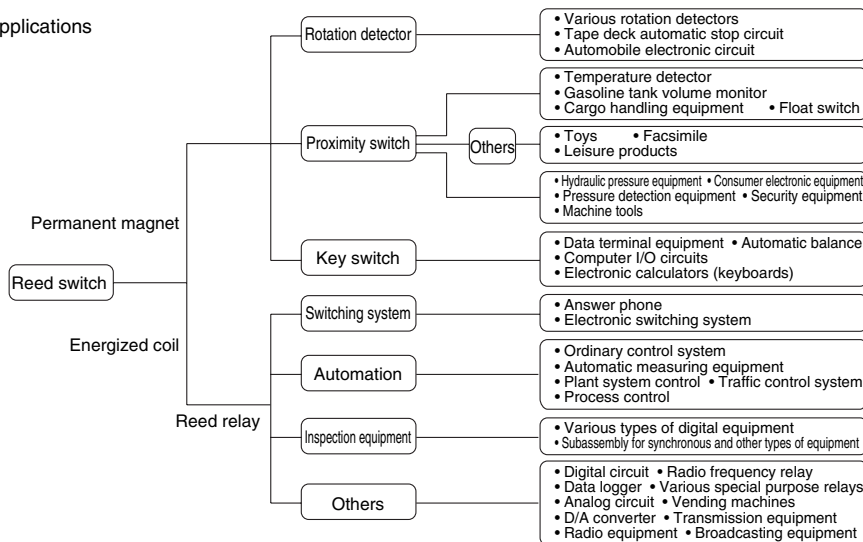
Furthermore, we received the Schneider Awards at the 36th and 38th Annual National Relay Conferences for research into reed switch contact phenomena. Our engineering and technology capabilities are evaluated highly.

1. Reed Switch Characteristics

Reed switch characteristics are discussed below.

- (1) Reed switches are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response because of small mass of moving parts
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

2. Applications



3. Structure and Operating Principles

As shown in Figure 3.1, the reed switches comprise two ferromagnetic reeds placed with a gap in between and hermetically sealed in a glass tube. The glass tube is filled with inert gas to prevent the activation of the contacts. The surfaces of the reed contacts are plated with rhodium.

As shown in Figure 3.2, the reed switch is

operated by the magnetic field of an energized coil or a permanent magnet which induces north (N) and south (S) poles on the reeds. The reed contacts are closed by this magnetic attractive force. When the magnetic field is removed, the reed elasticity causes the contacts to open the circuit.

Basic reed switch structure

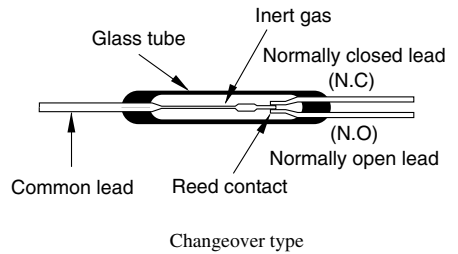
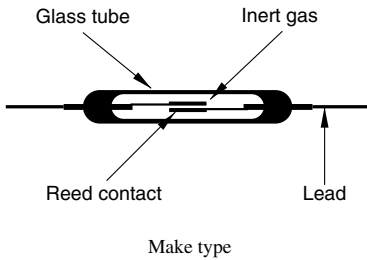
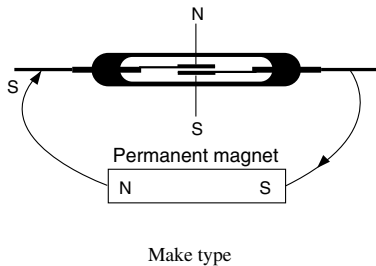
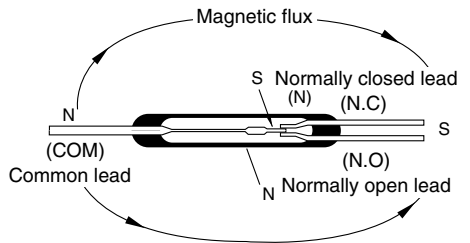
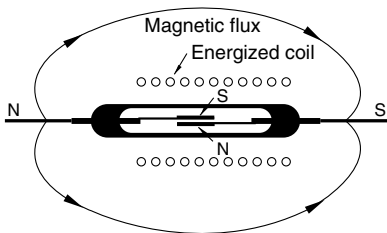


Figure 3.1

Reed switch operating principles



The changeover type reed switch is normally ON, due to mechanical bias of the common (COM) lead, which is between the normally closed (N.C) reed contact and the normally open (N.O) reed contact.

When an external magnetic field is induced, the N.C blade is not affected because it is non-magnetic but the COM lead is attracted by the N.O lead and moves. When the magnetic field is removed, COM lead again moves to the N.C lead by mechanical bias.

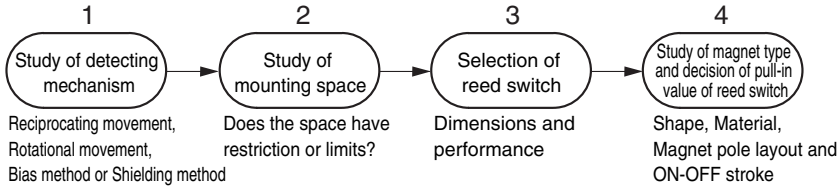
Changeover type

Figure 3.2

4. Permanent Magnet Drive

When a reed switch is driven by a permanent magnet, the selection of the permanent magnet and

the determination of its distance relative to the reed switch are done according to the following steps.



4-1 Permanent magnet drive method

The following four patterns 1) through 4) illustrate typical methods to drive the reed switch by

a permanent magnet.

1) Reciprocating method

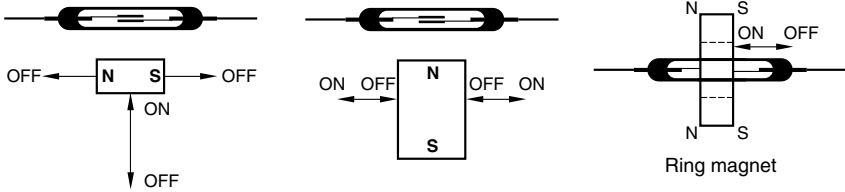


Figure 4.1

2) Rotational method

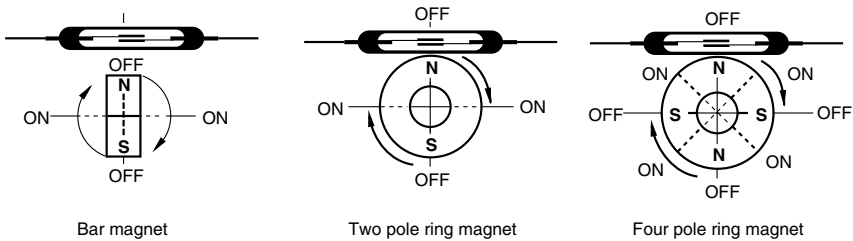
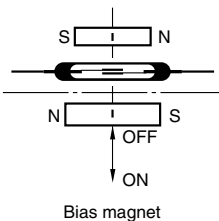


Figure 4.2

3) Bias method



4) Shielding method

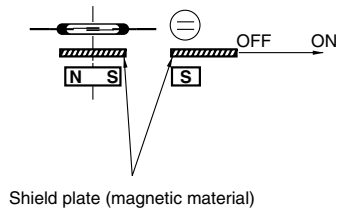


Figure 4.3

4-2 Permanent magnet drive characteristics

When a reed switch is operated by a permanent magnet, its ON-OFF domains will differ according to the type of the reed switch, its pull-in and drop-out values, read forming conditions as well as the

permanent magnet material, its shape, and magnetizing conditions.

Typical drive characteristics are shown below.

(1) X-Y characteristic H (horizontal)

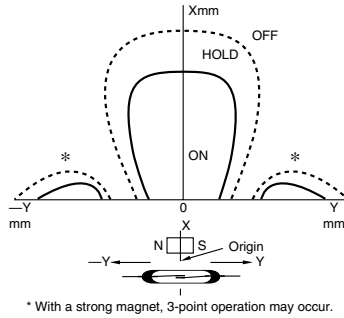


Figure 4.4

(2) X-Z characteristic H (horizontal)

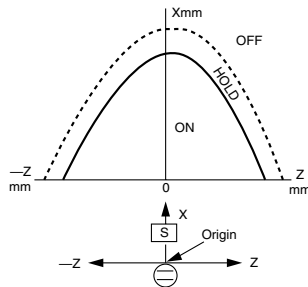


Figure 4.5

(3) X-Y characteristic V (vertical)

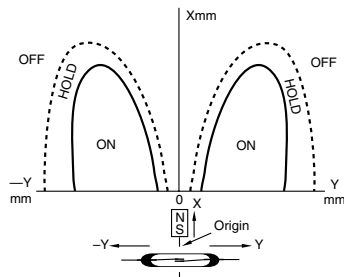
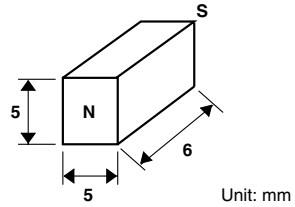


Figure 4.6

4-3 ORD228VL magnet drive characteristics example

Magnet: $5 \times 5 \times 6$ mm
 Anisotropic barium ferrite
 Surface magnetic flux: 120mT
 Reed switch: ORD228VL: Pull-in Value 10.0 (AT)
 Drop-out Value 7.3 (AT)



(1) X-Y characteristics H

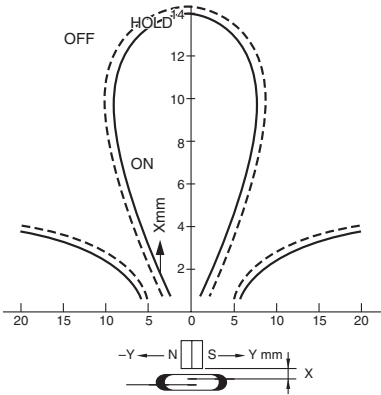


Figure 4.7

(2) X-Z characteristics H

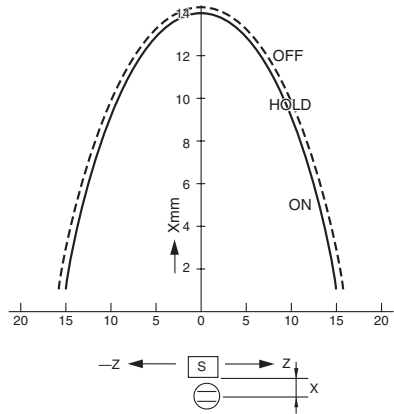


Figure 4.8

(4) X-Y characteristics V

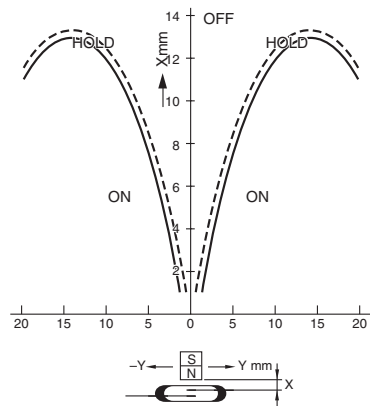
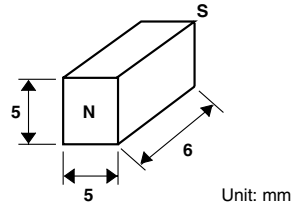


Figure 4.9

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4-3 ORD228VL magnet drive characteristics example (continuation)

Magnet: 5×5×6mm
 Anisotropic barium ferrite
 Surface magnetic flux 120 mT
 Reed switch: ORD228VL: Pull-in Value 20.0(AT)
 Drop-out Value 15.7(AT)



(1) X-Y characteristics H

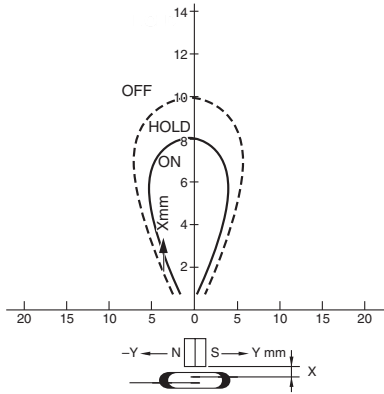


Figure 4.10

(2) X-Z characteristics H

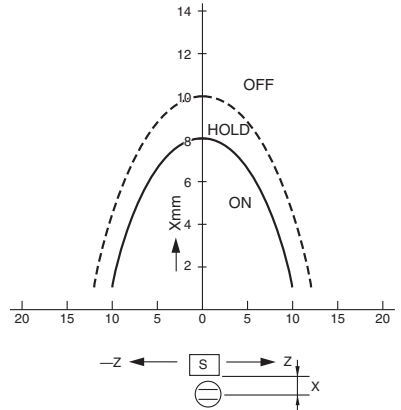


Figure 4.11

(4) X-Y characteristics V

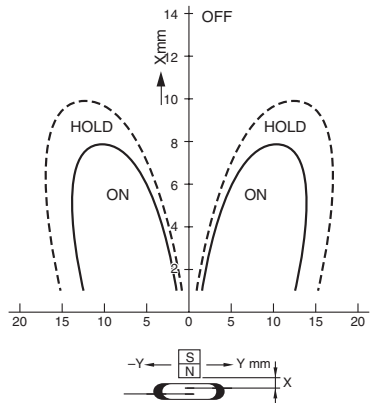


Figure 4.12

REED SWITCH RELIABILITY

Reed switches play important roles in the recent marked progress in the development of electronics and mechatronics equipment. Important applications of reed switches cover a wide variety of fields such as those in communications equipment, office automation equipment, control equipment, and consumer electronics equipment and the demands for these devices are steadily increasing.

Under these conditions, for example, a failure in communications equipment can have incalculable influence. Now, it is the obligation of manufacturers to supply reliable and high quality products. We are fully aware of our obligations in this regard.

Accordingly, we have adopted a comprehensive quality assurance system based on ISO9001 with integrated product policy in development, manufacturing, marketing and sales. Moreover, we will expand our efforts to meet the demands for improvements in performance and reliability of the products.

We outline below our quality assurance system and the underlying concepts that enable us to supply reliable quality products. Furthermore, we explain the reliability testing methods and our original technology which we use to maintain the high reliability in our reed switch products.

1. Quality Assurance System and Underlying Concepts

The goals of the quality assurance system employed by we are as follows:

- Supply of high quality product
- On-time delivery
- Rational product cost
- Customer oriented product marketing.

The flow of product quality assurance consists of the following four stages, consisting of Product planning stage, Development and prototype production stage, Trial mass production stage, and Mass production stage.

This system is illustrated in the block diagram shown in Figure 1.1.

1-1 Product planning stage

To manufacture products that meet market demands and satisfy customer needs, we carefully study functional and failure rate requirements, product applications, environments and other conditions. After these studies, we specify the

material, structure and the sizes of the products planned. We then proceed to the design plan, manufacturing engineering plan, and process capacity requirement plan. At this point, we prepare the development plans and time schedules.

1-2 Development and prototype production stage

At this stage, we concretely establish the required structure, dimensions, processes and assembly techniques. Furthermore, actual prototype testing is carried out to ensure reliability. Since most product quality is determined at the design stage, we build quality into the product design and pay careful attention to quality assurance during this stage.

Specifically,

- 1) After completing the basic design, the design engineering, production engineering and product reliability departments perform design reviews.
- 2) Prototypes are subjected to repeated functional and reliability testing. At this point, characteristics and reliability are confirmed while the stability and capacity of manufacturing processes are also confirmed.

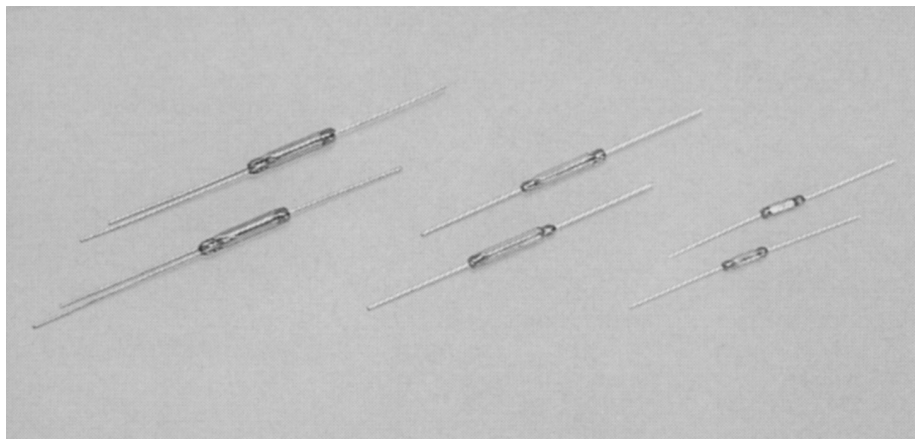
1-3 Trial mass production stage

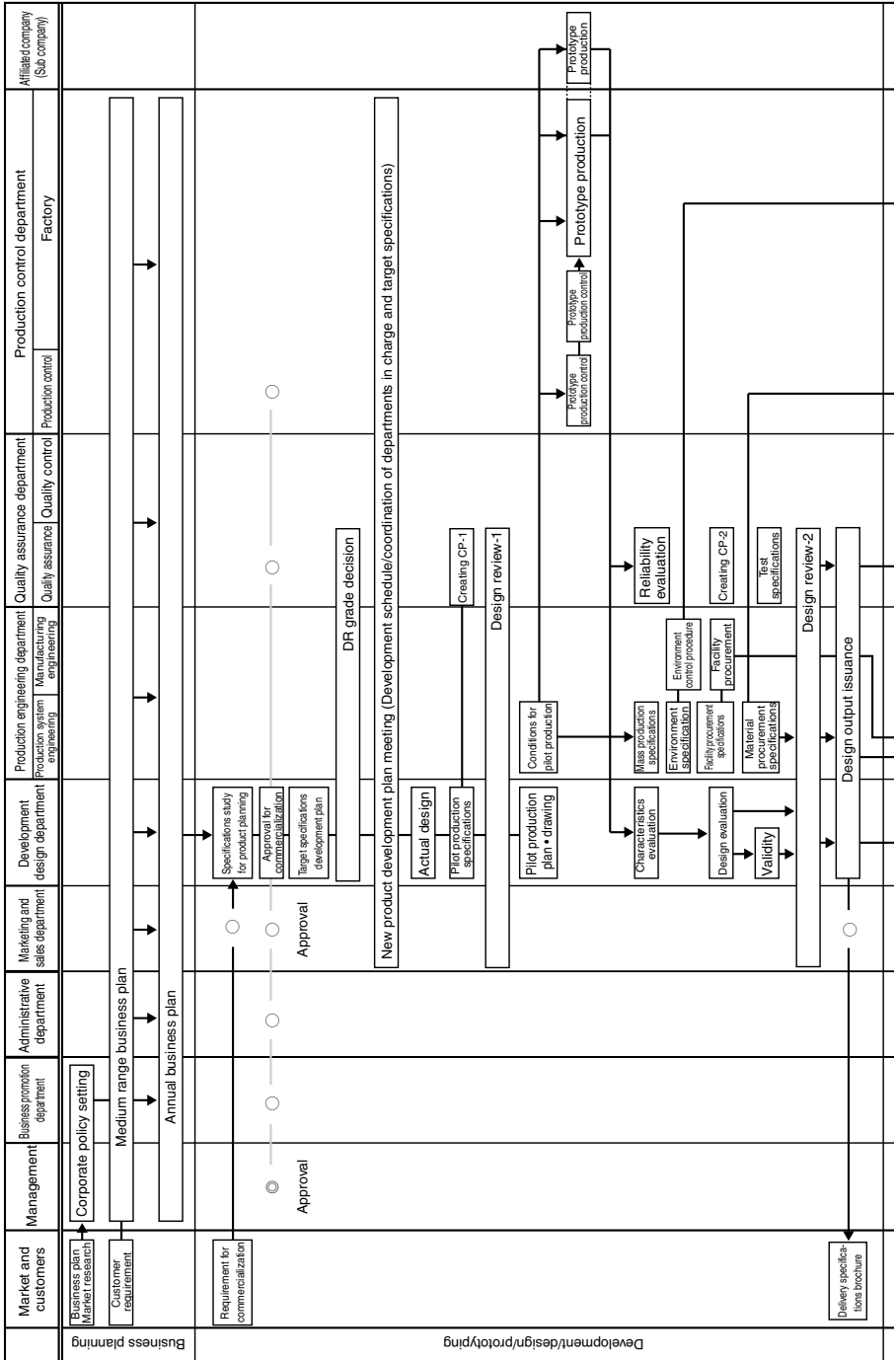
During this stage, various tests are performed to check the features and reliability mentioned above. These activities are aimed at the mass production level. After confirming product quality, we prepare the various mass production standards and start mass production.

1-4 Mass production stage

During the mass production stage, careful management of purchased materials and parts, facilities used during the manufacturing process, measuring equipment, manufacturing conditions and environment is necessary to ensure product quality stipulated during the designing stages. In-process quality and lot assurance inspections are shown in Figure 1.2.

Following lot assurance inspections, the products are placed in storage awaiting shipment to customers. Standards are also set up for handling, storage and transportation during this period, to ensure that no product quality problems develop before the product reaches the customers.





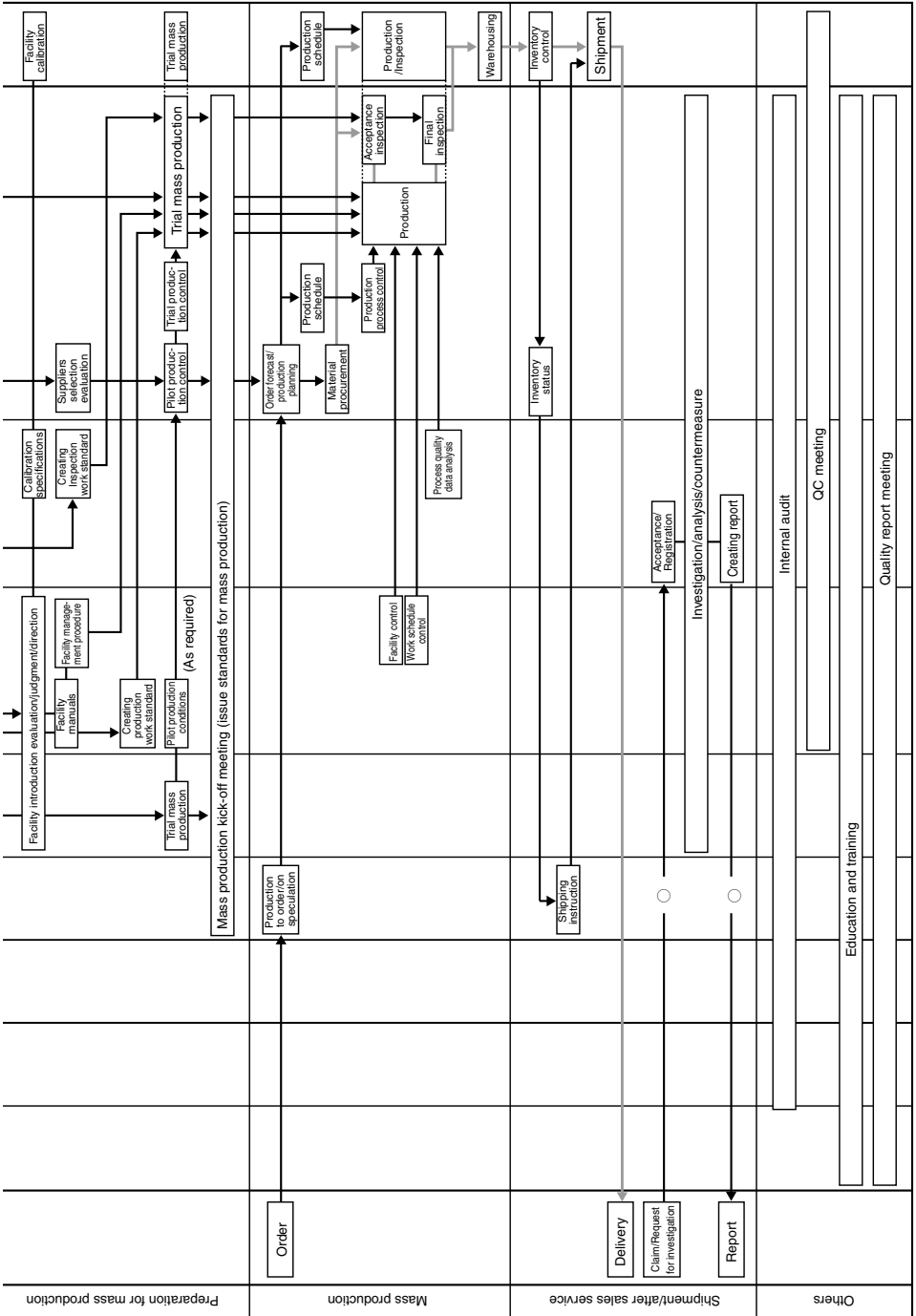


Figure 1.1 Quality assurance system

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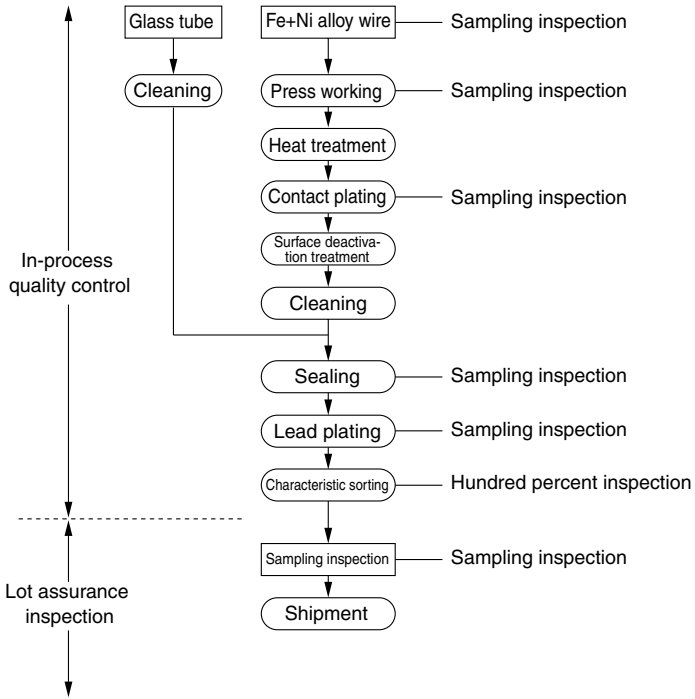


Figure 1.2 Quality control flow chart

All products are subjected to thorough quality checks as described above and shipped to the customers. If, by any chance, a failure does occur after delivery to the customers, defective products are processed and the problem is rectified immediately to minimize the inconvenience to the customers in accordance with the flow chart shown in Figure 1.3.

Quality improvement activities are employed to assure high quality product performance and reliability following the quality assurance and quality control flow shown in Figure 1.4.

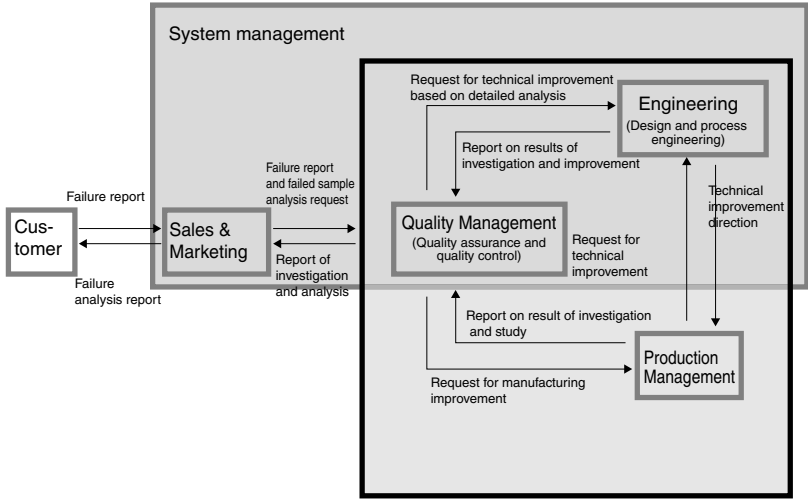


Figure 1.3 Failure report process flow chart



Figure 1.4 Quality assurance and quality control flow

2. Our Original Technology Supports High Reliability

2-1 Deactivated rhodium contacts

Our reed switches are extremely reliable because of the use of rhodium as the contact material. Rhodium has two superior properties for use as contact material.

The first is its extreme hardness which is effective in preventing sticking. The second is the high melting point which remarkably reduces contact surface wear caused by joule heat and arc discharge. However, since rhodium belongs to the platinum group, it is absorptive and catalytic.

Therefore, rhodium-plated contacts adsorb organic impurities and form polymers during operations as shown in Figure 2.1. This greatly increases the contact resistance. In the low-level load operation, this phenomenon is particularly noticeable.

In order to deactivate the rhodium-plated contact, we have developed a unique high temperature oxygen treatment. This technique makes the organic impurities built on the surface burned with oxygen and forms oxygen molecule layer on the contact which in turn provide stable contact resistance. This unique method won the highest prize (Schneider Award) at the 21st National Relay Conference in Oklahoma, USA, in 1973.

Our technology is valued highly, and at the 36th and 38th Annual National Relay Conferences we also received the Schneider Awards for research on reed switch contact surface phenomena.

Our patents have been registered in Japan (Pat. No. 916386), USA (Pat. No. 3857175) and Germany (Pat. No. 2303587)

2-2 High performance, automatic sealing equipment

Sealing is the process of forming the reed switch from the assembly of pressed and plated reed and glass tube. This is one of the most important processes which demands severe quality control and management. At the time of sealing, working temperature reaches 1000 °C which makes the glass tube impurities evaporate and causes the reed switch contact surface to be contaminated. To prevent the effects of these phenomena, we have developed severe standards for selection of glass material. In addition we also use unique technology for automatic sealing. Improvements in manufacturing

method such as these enable us to produce extremely high quality reed switches.

2-3 Magnetic flux scanning test (FS test) for measuring contact resistance

Sealing processes are performed under severe quality control and management. However, there is still a slight possibility for magnetic foreign particles to enter into the glass tube. We have conducted extensive research into the detection of microparticles and we developed the “Magnetic Flux Scanning Test” as an extremely high reliability technique for measuring contact resistance.

A general description is shown in Figure 2.2 where the magnetic attractive force from multiple layers of coils causes the magnetic foreign particles to move to the contact part of the reed switch. During check of the contact resistance, foreign particles are detected.

This new technology has allowed us to further improve reed switch reliability.

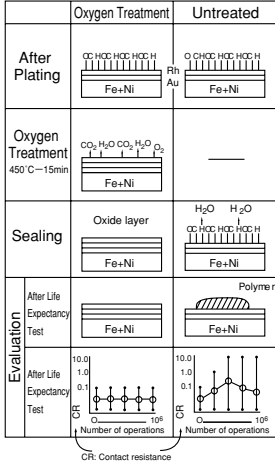


Figure 2.1

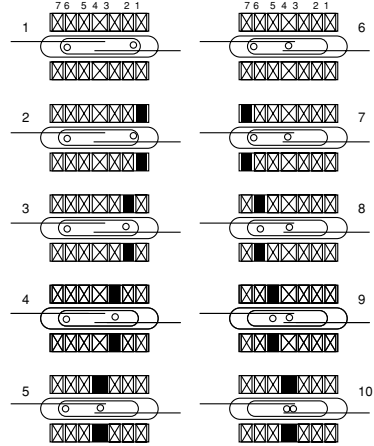


Figure 2.2 Magnetic Flux Scanning Test (FS Test)

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3. Reliability Testing Methods

Parameter	Specifications	Unit	Test method
Temperature and humidity cycle	-10~+65 (80~98)	°C (%)	MIL-STD-202G 106E (Refer to Figure 2.3)
Temperature cycle	-55~+125	°C	Chart is shown in Figure 2.4.
High temperature storage test	125	°C	500H
Low temperature storage test	-40	°C	500H
Shock Resistance	294min (30min)	G	MIL-STD-202G 213B Condition J
Vibration Resistance	196min (20min)	G	MIL-STD-202G 204D Condition D

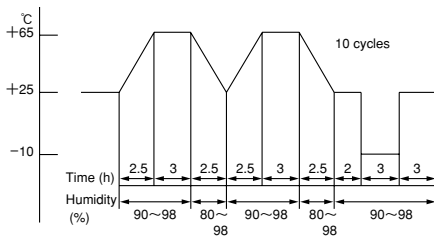


Figure 2.3 Temperature and humidity cycle chart

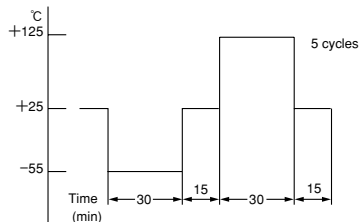


Figure 2.4 Temperature cycle chart

PRECAUTIONS AND APPLICATIONS

1. 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 contract protection circuits are also required for the reed switch

1-1 Inductive loads

In case an electromagnetic relay, electro-magnetic solenoid, or electromagnetic counter which has inductance 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 Figure 1.1.

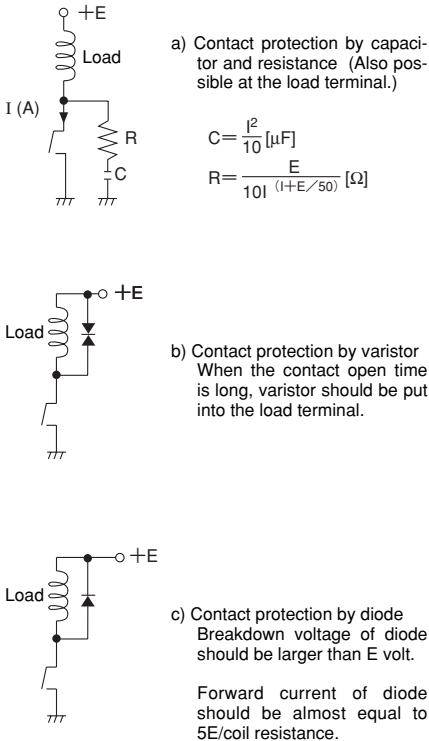


Figure 1.1

1-2 Capacitive loads

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. 1.2 shows typical examples of the protection circuits to prevent the rush current.

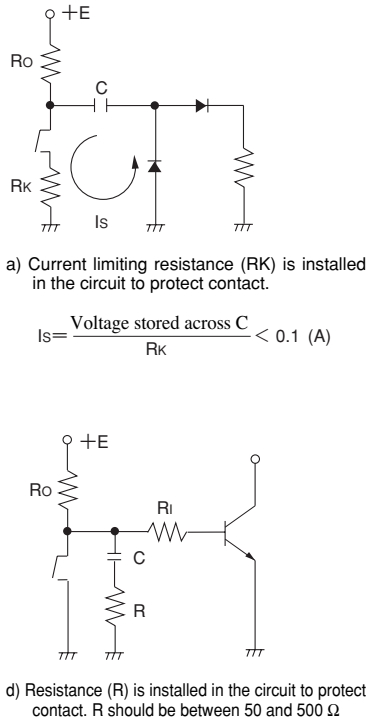
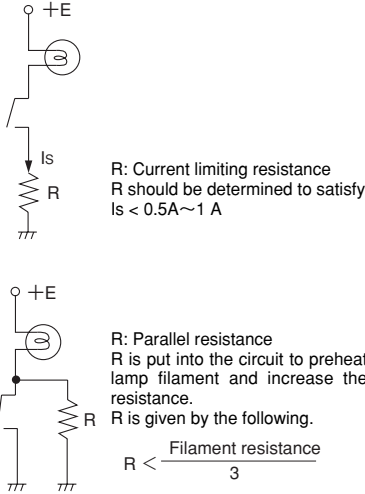


Figure 1.2

1-3 Lamp load

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. 1.3 shows examples of protection circuits.



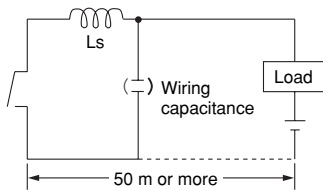
If no resistance is to be put into the circuit, use ORD2211.

Figure 1.3

1-4 Wiring capacitance

When wiring a load and reed switch over long distance, electrostatic capacitance arising from the cable can influence the reed switch contact. Therefore, inductance L_s should be used. L_s value differs according to the load current but should be in the range of 0.5 to 5 mH.

Wiring capacitance Load 50 m or more



2. Reed Switch Lead Forming

When reed switches are used, usually the leads are cut or bent. However, precautions should be taken when performing these processes.

- (1) Cutting and bending positions must be determined with reference to the center of the contact or to the end of the lead. If the position is measured from the end of the glass tube, the contact center position may be moved.
- (2) When in cutting or bending the leads, be sure to protect the sealing portions. As shown in Figure 2.1, the lead should be placed firmly by a jig.
- (3) After the process, confirm that there is no crack or chipping in the glass tube.

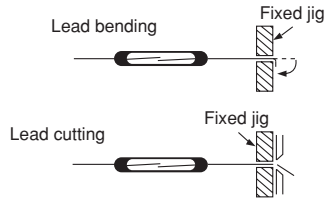


Figure 2.1

2-1 Cutting the 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. 2.2.

Here in this figure, a standard coil was used in making measurements and there may be differences when the reed switch is driven by a permanent magnet depending on the difference of the shape of magnet and orientation of magnetization. Therefore, it is necessary to actually examine the change of the pull-in and drop-out values by the magnet and drive method to be used. In some cases, a reed switch becomes more sensitive to a magnet than original.

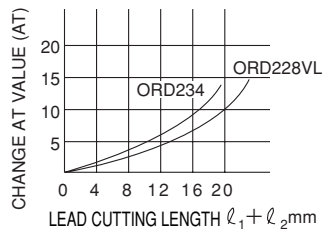


Figure 2.2

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2-2 Bending the leads

As in the case of cutting the leads, influence on the pull-in and drop-out characteristics must be checked by actually using the magnet and the driving method planned.

2-3 Measuring the electrical characteristics of reed switches after cutting or bending

When the leads of a reed switch are cut, it is not possible to measure electrical characteristics by using a standard test jig. However, it is possible to measure these characteristics after processing if a special jig is made. It is also possible to measure electrical characteristics of the reed switch with a bent lead by using the jig similar to the one used for a reed switch with a cut lead. However, when both leads are bent, the reed switch cannot be inserted into a coil and therefore cannot be measured.

3. Reed Switch Mounting

Generally, a reed switch is mounted by soldering or welding. When the mounting space (including its vicinity) is non-magnetic, there is no influence on operation but when the material is magnetic, operation characteristics do change. Therefore, it is necessary to check these in consideration of the assembling conditions.

3-1 Soldering

Leads are tin plated and are soldered ordinarily (250 to 360 °C). When soldering, keep the soldering point at least 1 mm away from the glass end. In addition, there is also a danger of causing the glass tube to be damaged by heat if the soldering is done for a long time. Keep the process to less than five seconds.

3-2 Welding

When welding, also keep the welding point at least 1 mm away from the glass end. When using a large power supply for welding, heat generated in lead may cause damage to the glass tube. Precautions to prevent this are necessary.

Welding current may also induce magnetic field and cause the reed switch to operate. Therefore, it may introduce welding current to the contact and contact may be melted. Precautions are also necessary.

3-3 Ultrasonic welding

Be very careful when using ultrasonic welding methods to weld reed switches or using ultrasonic welder in the vicinity of a reed switch. The ultrasonic can change the contact gap and the characteristics of the reed switch.

3-4 Mounting on a printed circuit board

When mounting on a printed circuit board, the reed switch should float on the board as shown in Figure 3.1 or hole should be opened in the printed circuit board to prevent the glass from touching the board surface. Otherwise, it is possible to cause damage to the glass tube because of physical shocks or other adverse elements applied externally to it.

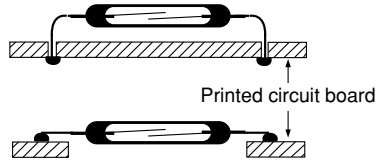


Figure 3.1

4. Reed Switch Resin Mold

When reed switches are molded with resin, it is possible for the resin stress to break or damage the glass tube. Therefore, the resin should be selected carefully. Moreover, it is necessary to perform temperature cycle testing to ensure selection of safe resin material.

On the other hand, there is no problem if silicone or other soft resin is used.

5. Dropping Reed Switches

Avoid dropping reed switches. If a reed switch is dropped onto a hard surface from a height more than 30 cm, it is possible to cause the characteristics to change. If a reed switch has been dropped, carefully inspect its characteristics and exterior appearance before use. If a reed switch has been subjected to shock more than 294 m/s^2 , the pull-in value may change.

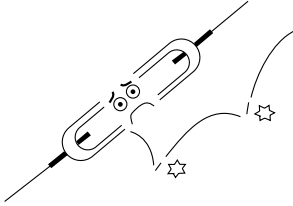


Figure 3.2

6. Relation to Characteristic Values Given by Other Makers

Measurement methods are manufacture dependent. Therefore, the pull-in value may be different depending on the measurement conditions (standard coils and overall length of the reed switch are different). Accordingly, it is necessary to correlate the characteristics.

7. Certified Pull-in Value for Reed Switches

The pull-in value (four digits) shown on the reed switch package is selected range values. The certified pull-in value for this selected range has a tolerance of $\pm 2\text{AT}$.

Example: Certified pull-in value for ORD211 (2025) is 18 to 27 AT.

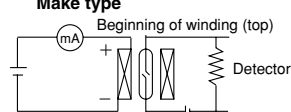
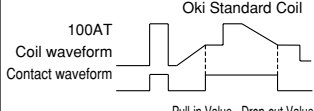
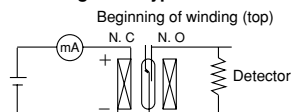
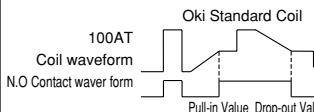
8. Specifications

Since these specifications are subject to change without prior notice due to technical improvements, be sure to consult the most recent Databook for information on specifications.

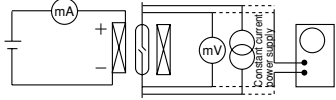
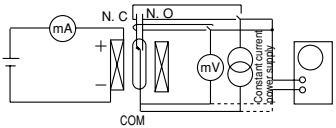
● DESCRIPTION OF SYMBOLS AND TERMS

DESCRIPTION OF SYMBOLS AND TERMS

Following is generally used terms regarding the basic operating characteristics of the reed switches.

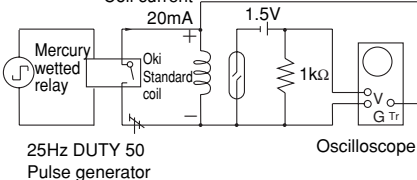
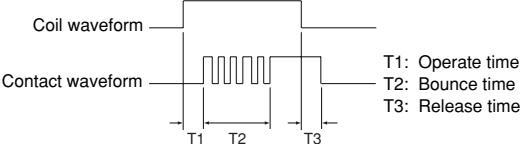
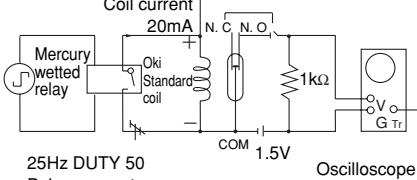
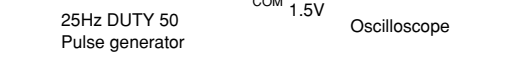
Term	Symbol	Unit	Description and Test Methods
Pull-in Value	PI	AT	<ul style="list-style-type: none"> This is the most important operating characteristic of a reed switch. It is given as the product of the energizing current for the coil necessary to operate the switch and the number of turns of the coil winding. This is the sensitivity of reed switch. High sensitivity means low pull-in value.
Drop-out Value	DO	AT	<ul style="list-style-type: none"> Drop-out value is obtained by taking the product of the value of the current flowing in the coil at the time when the contacts are released and the number of turns of the coil windings. Drop-out value is correlative to pull-in value and is a secondary value. Test method (1) Measurement circuits of pull-in and drop-out values <p>Make type</p>  <p>Coil saturation current 20mA (SOAK) 100AT</p> <p>Ok! Standard Coil Voltage between contacts 2 to 10 V: DC Current between contacts (less than 10 mA)</p>  <p>Current at time of operation x number of turns in standard coil (5000T): Indicated in AT</p> <p>change over type</p>  <p>Coil saturation current 20mA (SOAK) 100AT</p> <p>Ok! Standard Coil Voltage between contacts 2 to 10 V: DC Current between contacts (less than 10 mA)</p>  <p>Current at time of operation x number of turns in standard coil (5000T): Indicated in AT</p>

1

Term	Symbol	Unit	Description and Test Methods
			<p>Note: Measure after making sure that the center of the coil and the center of the reed switch contacts are aligned. Initially, apply soak current (100 AT) then return to zero (AT). Next, apply the current in the same direction and measure it. The polarity of the current applied to the coil should make the direction of the energized magnetic field to be the same as the direction of terrestrial magnetism. (The leading end of the coil-wire at the top should have positive polarity.)</p>
Contact resistance	CR	mΩ	<ul style="list-style-type: none"> • Contact resistance is the resistance between contacts when the contacts are closed and includes conductor resistance. • Test method (2) Measurement circuit of contact resistance <p>Make type</p>  <p>Oki Standard Coil Microohmmeter (YHP-4328A or equivalent)</p> <p>{ Applied voltage for measurement (less than 10V DC) } or Microohmmeter { Current for measurement (less than 10 mA) }</p> <p>Coil current 20 mA (100AT)</p> <p>change over type</p>  <p>Oki Standard Coil Microohmmeter (YHP-4328A or equivalent)</p> <p>{ Applied voltage for measurement (less than 10V DC) } or Microohmmeter { Current for measurement (less than 10 mA) }</p> <p>Coil current 20 mA (100AT) N.O. 0 mA (0AT) N.C</p>
Breakdown voltage		V	<ul style="list-style-type: none"> • Specifies a maximum value of transient voltage over the contacts caused by surge current or other external factors. Below this rated value, the reed switch operates without destruction of its contact insulation resistance.

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Term	Symbol	Unit	Description and Test Methods
			<ul style="list-style-type: none"> Test method: MIL-STD-202G METHOD301 Breakdown voltage varies depending on pull-in value. Breakdown voltage shown here is the value measured for the switch whose pull-in value is 20 AT or more. The criterion of leak current is less than 0.1 mA for one minute.
Insulation Resistance		V	<ul style="list-style-type: none"> Insulation resistance is the resistance between lead ends and the resistance against leak current across the reed switch glass tube or its surface. Test method: MIL-STD-202G METHOD302 (Measurement is made by using a DC 100 V super megger.)
Electrostatic Capacitance		pF	<ul style="list-style-type: none"> Electrostatic capacitance is the value of capacitance between open contacts. The overlap of reed switch contacts is uniform. Therefore, when the contact gap becomes large, accompanying an increase in pull-in value, the electrostatic capacitance becomes small. Electrostatic capacitance is measured at 1MHz-0.1V.
Contact rating		W VA	<ul style="list-style-type: none"> Contact rating is the maximum product of the voltage and current at which contacts operate and contact switching performance is stable. This is a very important value. In order to anticipate constant life expectancy and assure reliability when switching is performed, the contact rating must not be exceeded and it is less than the product of (maximum switching voltage) X (maximum switching current). Contact rating is also called contact capacitance or contact power allowance.
Maximum switching voltage		V	<ul style="list-style-type: none"> Maximum switching voltage is the maximum voltage at which contacts can be switched. It is used as a reference value of voltage for contact switching performance. In order to anticipate constant life expectancy and assure reliability when switching is performed, the maximum switching voltage must not be exceeded. Maximum switching voltage is also called rated contact voltage, maximum Working voltage, or allowable contact voltage.
Maximum switching current		A	<ul style="list-style-type: none"> Maximum switching current is the maximum current at which contacts can be switched. It is a reference value of current for contact switching performance. In order to anticipate constant life expectancy and assure reliability when switching is performed, the maximum switching current must not be exceeded. Maximum switching current is also called rated contact current, maximum on-off contact current, or rated on-off current.
Maximum carry current		A	<ul style="list-style-type: none"> Maximum carry current is the maximum current which can flow continuously over the closed contact. In order to anticipate constant life expectancy and assure reliability, the maximum switching carry current must not be exceeded. Maximum carry current is also called rated contact carry current or allowable contact carry current.

Term	Symbol	Unit	Description and Test Methods
Operate time	Top	ms	<ul style="list-style-type: none"> Operate time means the time required for the contacts to close after applying voltage to the energizing coil. Unless otherwise specified, operate time does not include bounce time.
Bounce time	Tb	ms	<ul style="list-style-type: none"> Bounce time means the time between the time when the contacts closed initially and the time when they come to close stably.
Release time	Trls	ms (μ s)	<ul style="list-style-type: none"> Release time is the elapsed time before the contacts are opened after the coil energizing voltage is removed.
			<ul style="list-style-type: none"> Test method (3) Time characteristics measurement circuit <p>Make type</p>  <p>25Hz DUTY 50 Pulse generator</p>  <p>Coil waveform</p> <p>Contact waveform</p> <p>T1: Operate time T2: Bounce time T3: Release time</p> <p>change over type</p>  <p>25Hz DUTY 50 Pulse generator</p>  <p>Coil current 20mA</p> <p>Mercury wetted relay</p> <p>Oki Standard coil</p> <p>1.5V</p> <p>1kΩ</p> <p>Oscilloscope</p> <p>25Hz DUTY 50 Pulse generator</p> <p>N. C. N. O. COM</p> <p>1.5V</p>

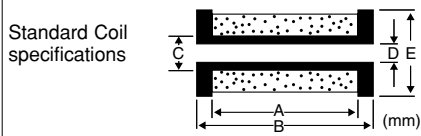
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Term	Symbol	Unit	Description and Test Method
			<p>Coil waveform</p> <p>(N.O.) contact waveform</p> <p>(N.C.) contact waveform</p> <p>N.O T1: Operate time T2: Bounce time T3: Release time</p> <p>N.C T4: Operate time T5: Release time T6: Bounce time</p> <p>(T7: Transfer time (N.C→N.O) T8: Transfer time (N.C→N.O))</p> <p>Note: Measure after making sure that the center of the coil and the center of the reed switch contacts are aligned.</p>

Resonant frequency		Hz	<ul style="list-style-type: none"> Resonant frequency is the vibration frequency inherent to the reed switch. If the reed switch is subjected to vibrations which have the similar frequency to the resonant frequency, it may cause misoperation.
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Maximum operating frequency		Hz	<ul style="list-style-type: none"> Maximum operating frequency is the maximum drive frequency. The reed switch can be operated with a frequency higher than the maximum operating frequency. However, operation with such a frequency may cause an endless bouncing.
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Standard coil		Number	<ul style="list-style-type: none"> The standard coil is the coil provided for measuring reed switch characteristics. The standard coil varies depending on the type of the reed switch.
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Number	No.3	No.6	No.8	No.10	901	903
A	21	15	10	10	12	5
B	25	19	12	26	15	7.5
C	Φ 4.6	Φ 3.7	Φ 3.3	Φ 4.6	Φ 5.0	Φ 4.4
D	Φ 3.5	Φ 2.9	Φ 2.3	Φ 3.5	Φ 3.6	Φ 3.0
E	Φ 11.0	Φ 11.0	Φ 11.0	Φ 13.0	Φ 16.0	Φ 20.0
Coil resistance (Number of Turns)	500 Ω (5000T)	450 Ω (5000T)	600 Ω (5000T)	550 Ω (5000T)	550 Ω (5000T)	930 Ω (5000T)
Measured read switch	ORD229 ORD2210 ORD234 ORD2210V	ORD219 ORD221 ORD226VL ORD2211 ORD2212 ORD2220 ORD2221 ORD2221 ORD9215 ORD9216 ORD312	ORD211 ORD213 ORD311	ORT551	RA-901	RA-903



APPLICATION NOTES

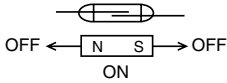
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◇ APPLICATION NOTES

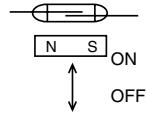
The potential applications for reed switches are very broad. The main applications for reed switches are in automotive electronic devices, various types of instruments and testers, household appliances and so forth. Here, some actual examples of reed switch applications are provided.

Reed switch application examples-I

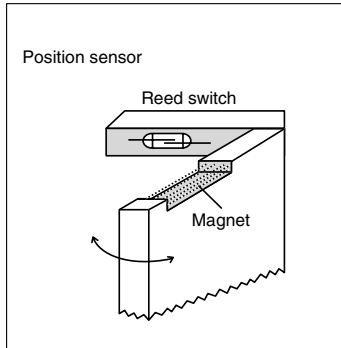
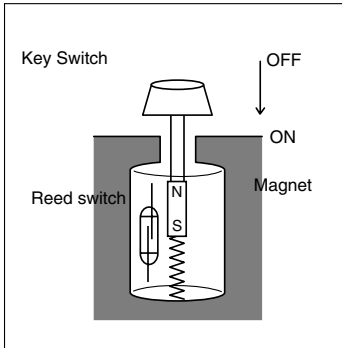
Reciprocating operation



Reciprocating operation

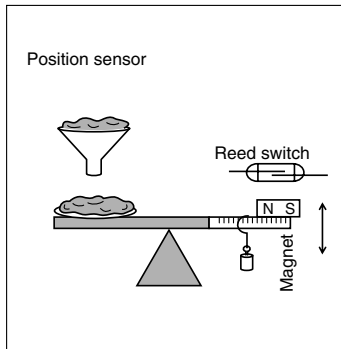
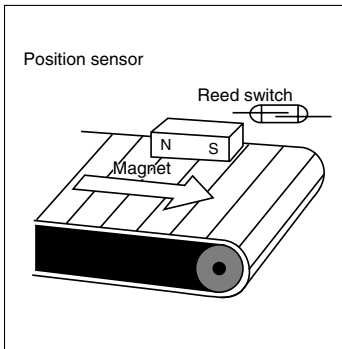


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Application examples:
Various types of button switches
Keyboard

Application examples:
Various types of door sensors
Security system

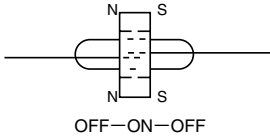


Application examples:
Various types of position sensors
Conveyor control

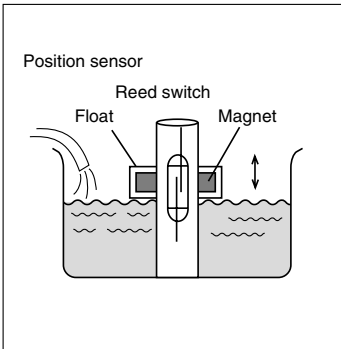
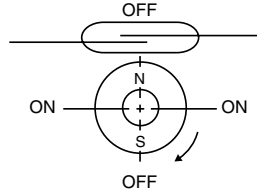
Application examples: Automatic balance

Reed switch application examples-II

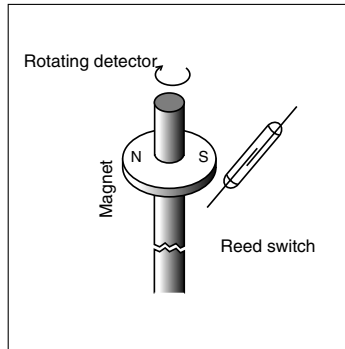
Position sensor



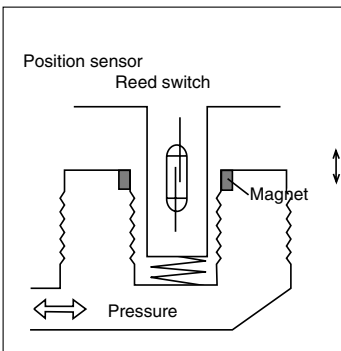
Rotating operation



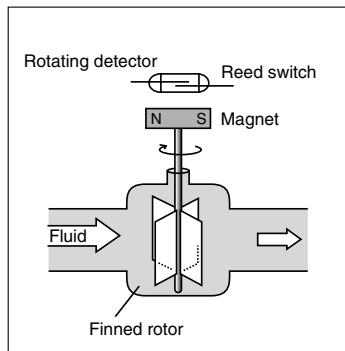
Application examples: Liquid level sensor
Various float switches



Application examples:
Various types of rotation sensor



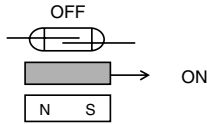
Application examples: Pressure sensor
Wind pressure sensor



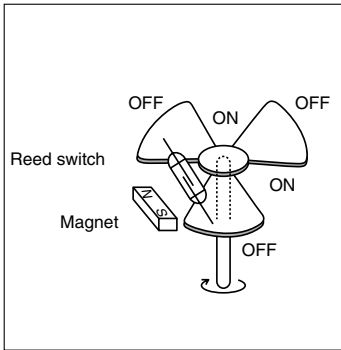
Application examples:
Various types of fluid level sensor
Flow measurement instruments for water,
gas, and wind

Reed switch application examples-III

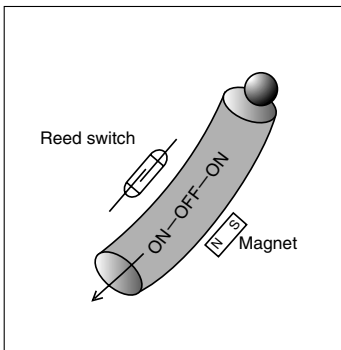
Shielding operation



Magnetic substance (shielded plate)



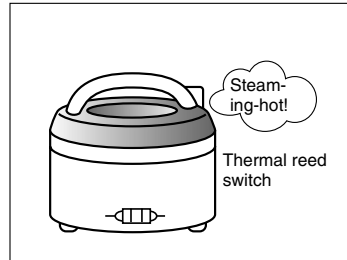
Application examples: Pulse generator



Application examples: Detecting the passing of various types of magnetic substances

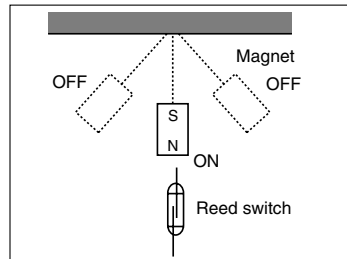
Miscellaneous reed switch application examples

☆ Temperature sensor (Combination of thermal ferrite)



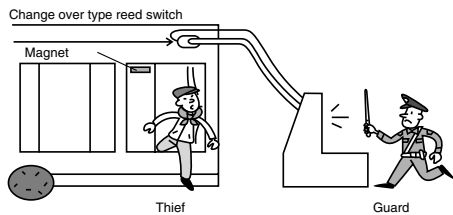
Application examples: Electronic cooker, Heat detector

☆ Tilt detection



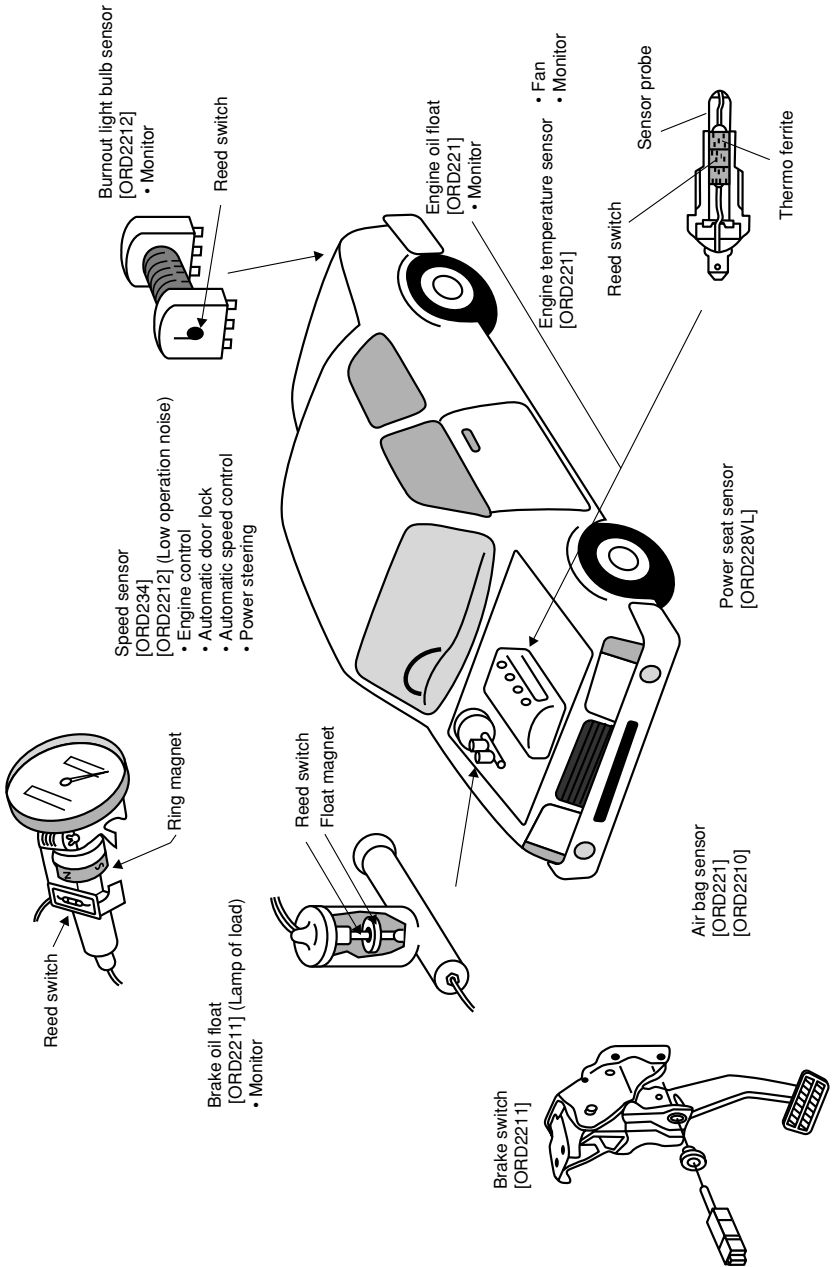
Application examples: Security system, seismic sensor

☆ Security system

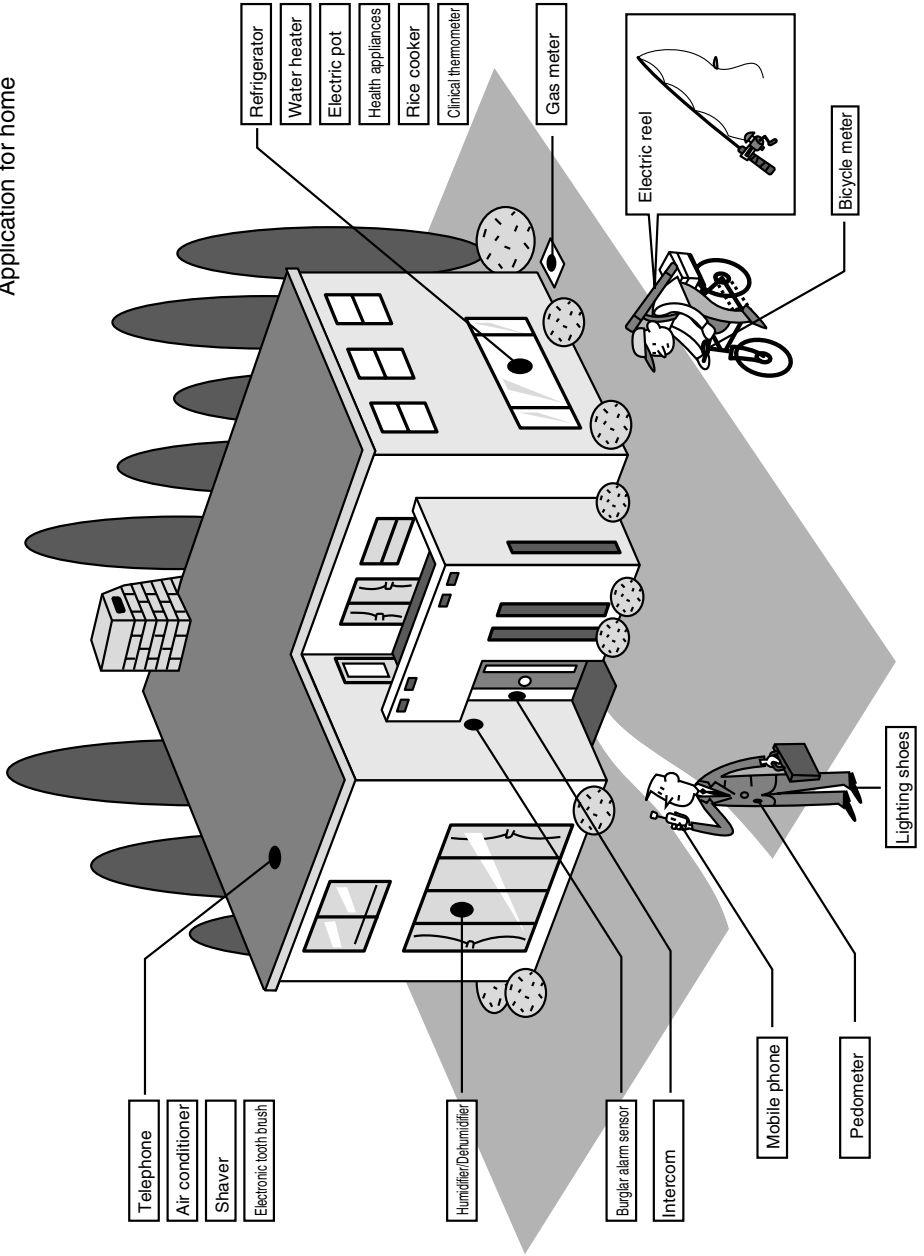


2

Reed switch Application example: Car



Application for home



DATA SHEETS

3

REED SWITCH

ORD211

Ultra-miniature

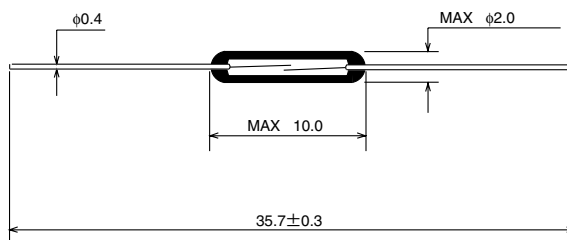
■ GENERAL DESCRIPTION

The ORD211 is a small single-contact reed switch designed for general control of low-level loads less than 24 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

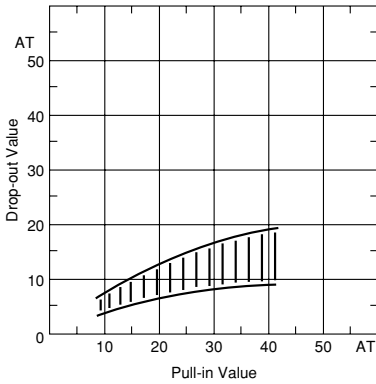
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

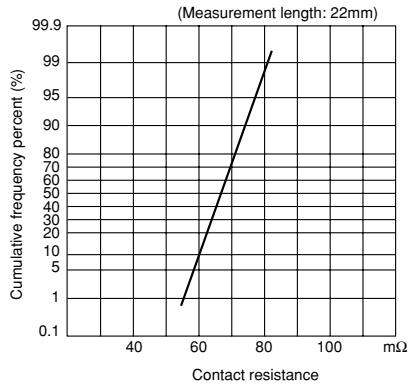
Parameter	Rated value	Unit
Pull-in Value (PI)	10~40	AT
Drop-out Value (DO)	5min	AT
Contact resistance (CR)	100max	mΩ
Breakdown voltage	150min	VDC
Insulation resistance	10 ⁹ min	Ω
Electrostatic capacitance	0.2max	pF
Contact rating	1.0	VA
Maximum switching voltage	24 ($\frac{DC}{AC}$)	V
Maximum switching current	0.1	A
Maximum carry current	0.3	A

3

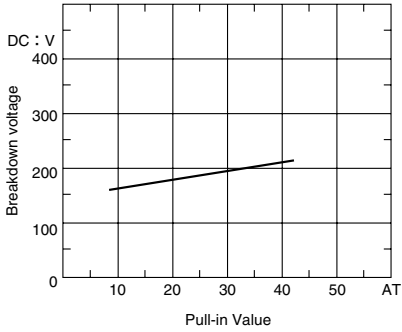
(1) Pull-in Value vs. Drop-out Value



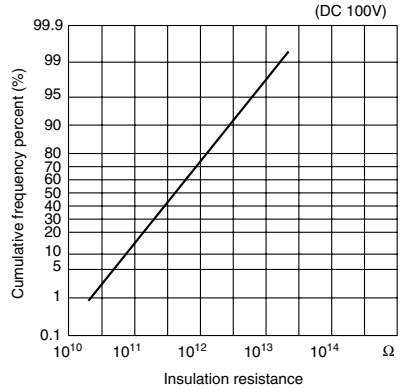
(2) Contact resistance



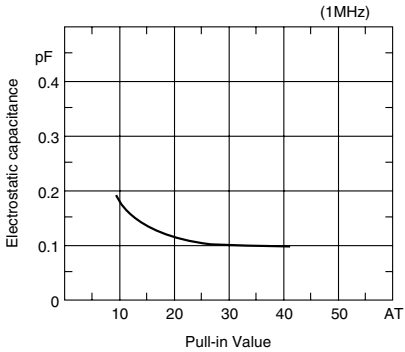
(3) Breakdown voltage



(4) Insulation resistance



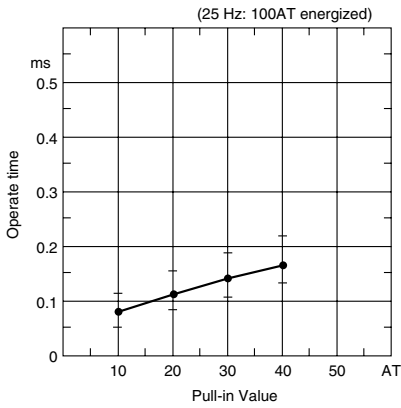
(5) Electrostatic capacitance



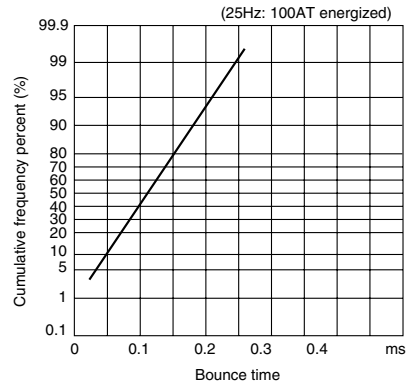
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	0.3max	ms
Bounce time	0.3max	ms
Release time	0.05max	ms
Resonant frequency	7500±500	Hz
Maximum operating frequency	500	Hz

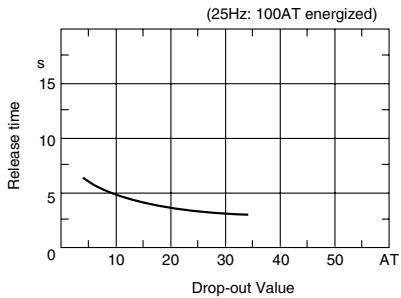
(1) Operate time



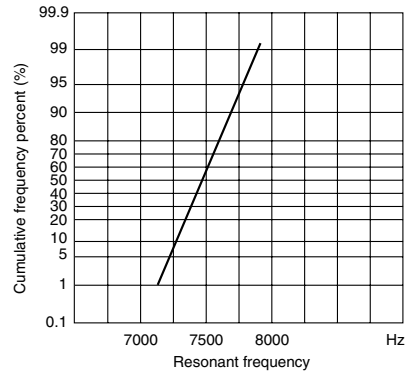
(2) Bounce time



(3) Release time



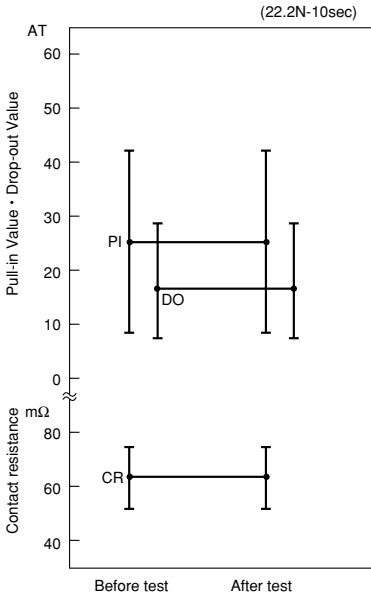
(4) Resonant frequency



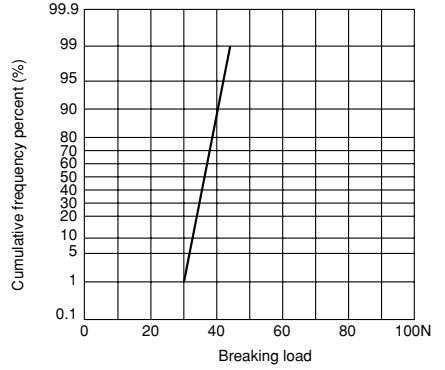
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■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



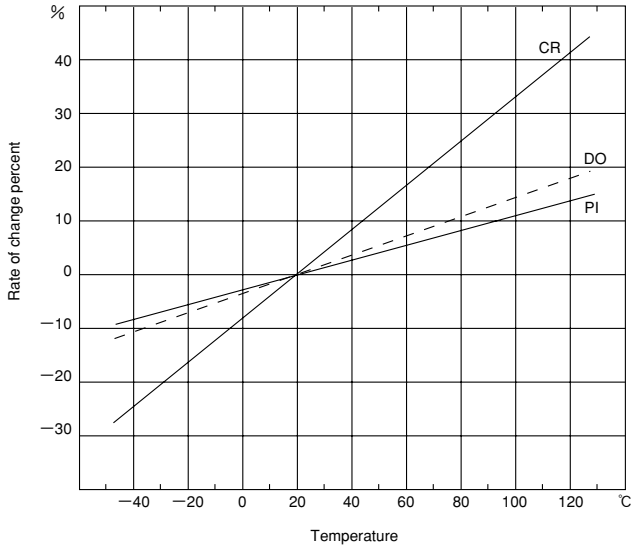
(2) Lead tensile strength



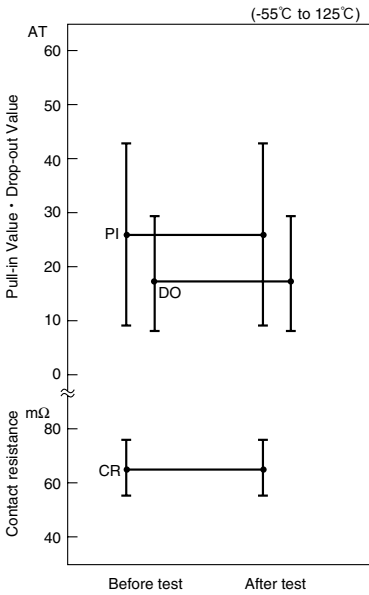
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■ ENVIRONMENTAL CHARACTERISTICS

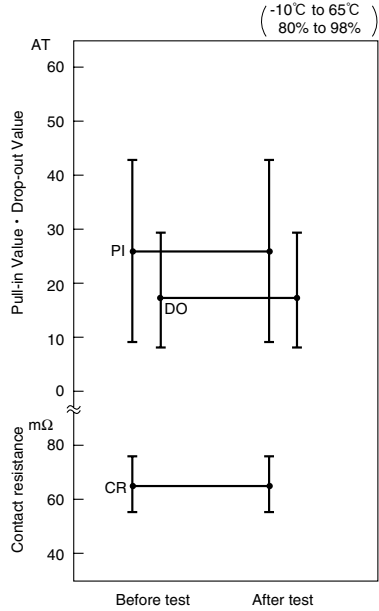
(1) Temperature characteristics



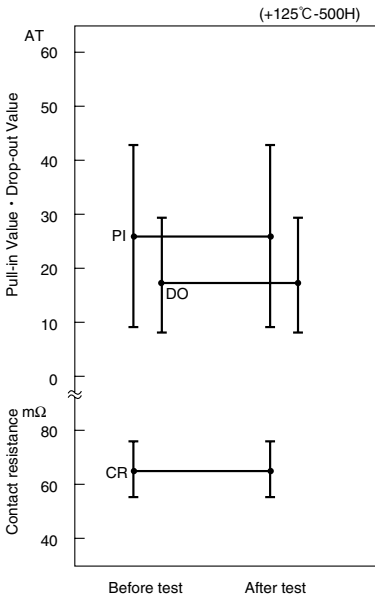
(2) Temperature cycle



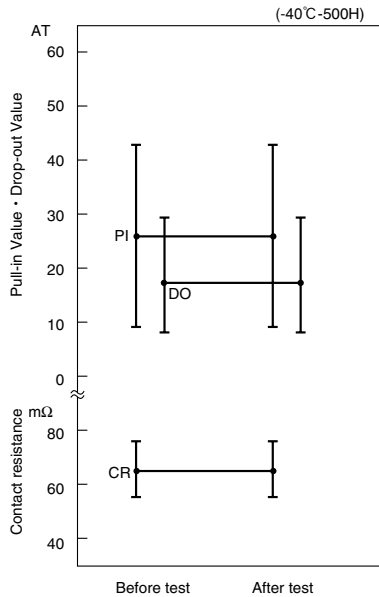
(3) Temperature and humidity cycle



(4) High temperature storage test



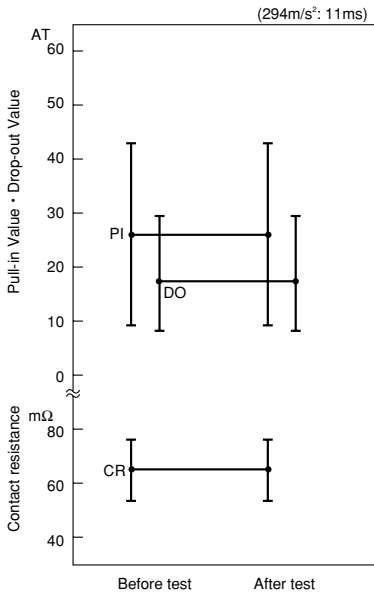
(5) Low temperature storage test



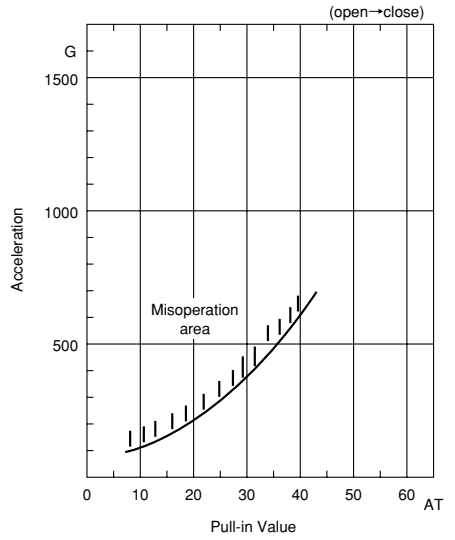
3

(6) Shock test

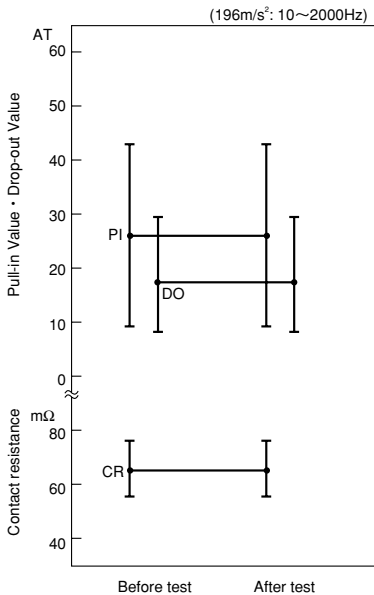
1) Electrical characteristics



2) Misoperation area

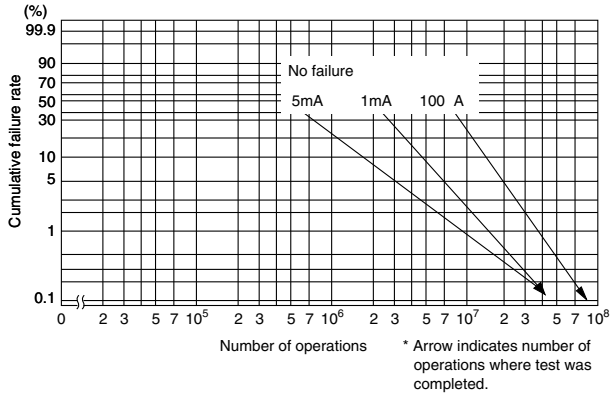


(7) Vibration test



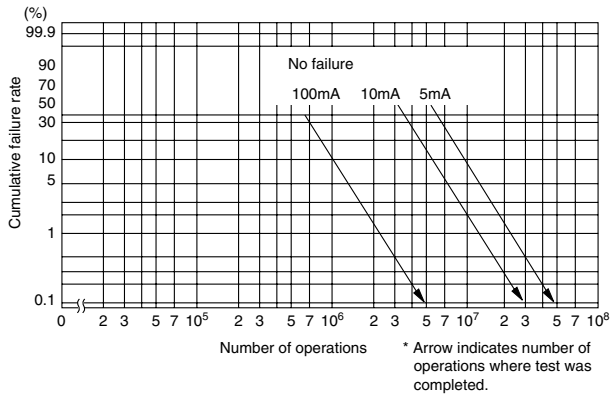
■ LIFE EXPECTANCY DATA: ORD211

Load conditions
 Voltage: 5VDC
 Current: 100 A, 1 mA, 5 mA
 Load: Resistive load

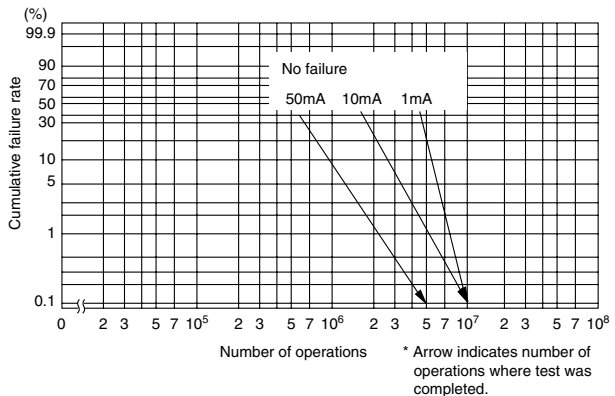


3

Load conditions
 Voltage: 12VDC
 Current: 5 mA, 10 mA, 100 mA
 Load: Resistive load



Load conditions
 Voltage: 24VDC
 Current: 1 mA, 10 mA, 50 mA
 Load: Resistive load



REED SWITCH

ORD213

Super Ultraminiature

■ GENERAL DESCRIPTION

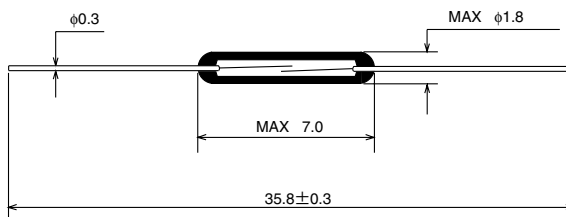
The ORD213 is a small single-contact reed switch designed for general control of low-level loads less than 24 V. The reed contacts are sealed within the glass tube within inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

3

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

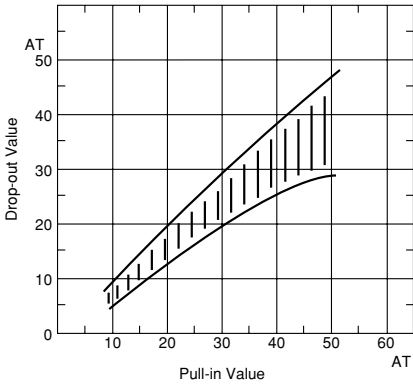
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

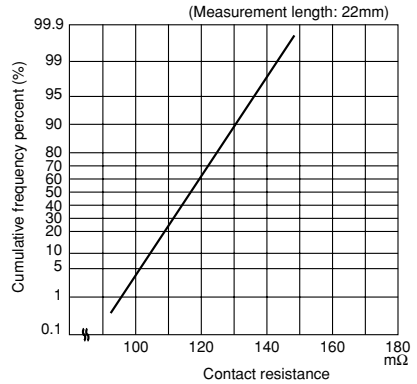
Parameter	Rated value	Unit
Pull-in Value (PI)	10~40	AT
Drop-out Value (DO)	5min	AT
Contact resistance (CR)	200max	mΩ
Breakdown voltage	150min	VDC
Insulation resistance	10 ⁹ min	Ω
Electrostatic capacitance	0.4max	pF
Contact rating	1.0	VA
Maximum switching voltage	24 ($\frac{DC}{AC}$)	V
Maximum switching current	0.1	A
Maximum carry current	0.3	A

3

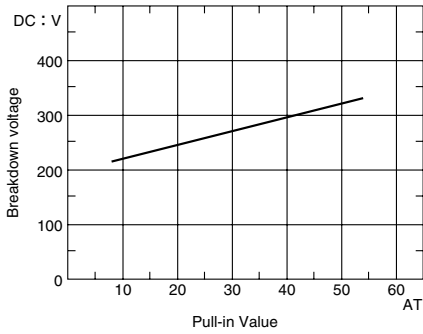
(1) Pull-in Value vs. Drop-out Value



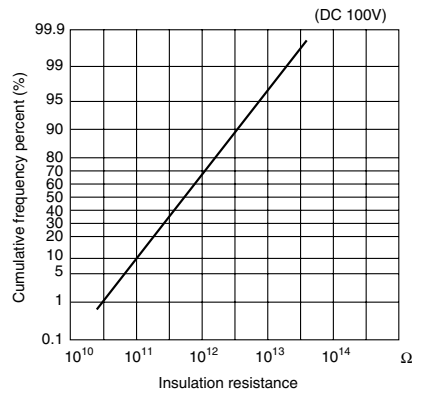
(2) Contact resistance



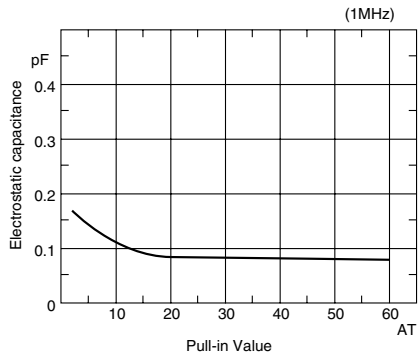
(3) Breakdown voltage



(4) Insulation resistance



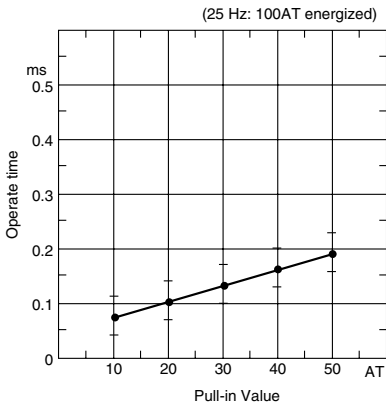
(5) Electrostatic capacitance



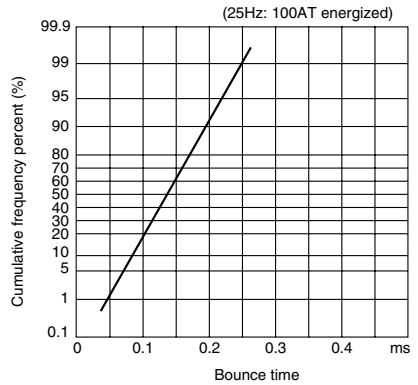
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	0.3max	ms
Bounce time	0.3max	ms
Release time	0.05max	ms
Resonant frequency	11000±2000	Hz
Maximum operating frequency	500	Hz

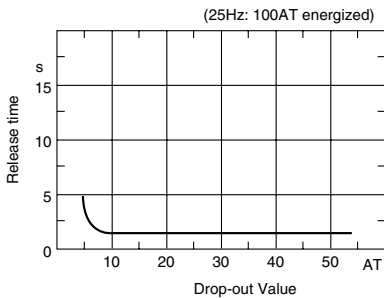
(1) Operate time



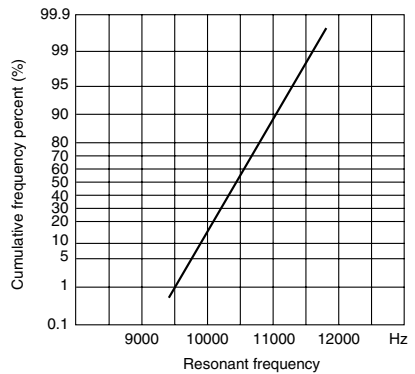
(2) Bounce time



(3) Release time



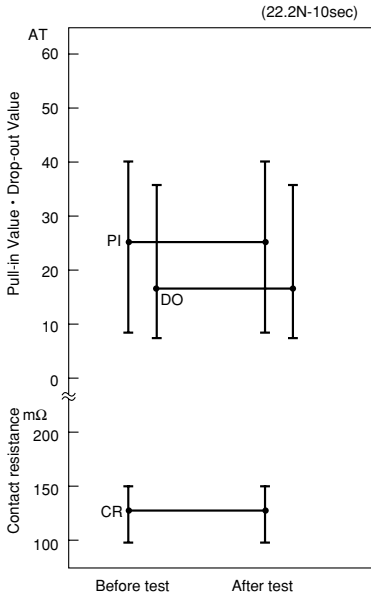
(4) Resonant frequency



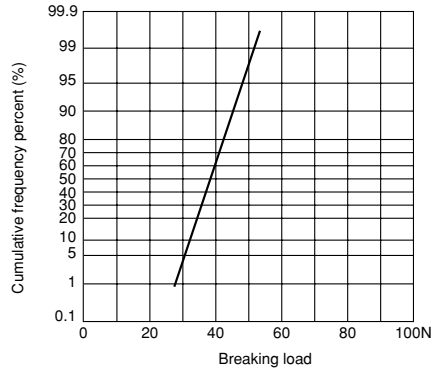
3

■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



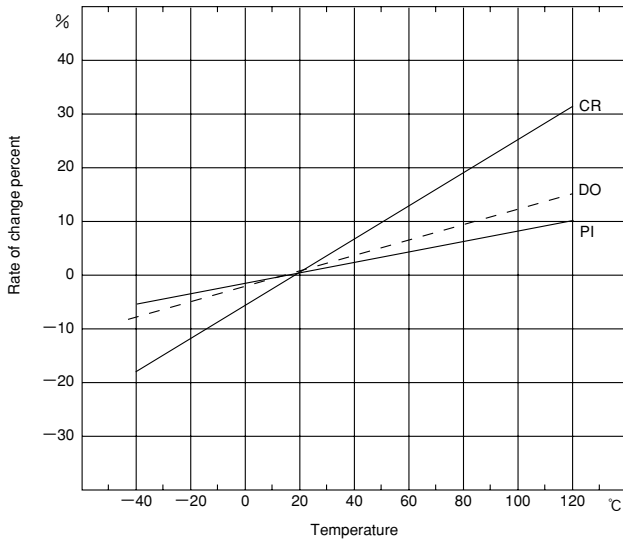
(2) Lead tensile strength



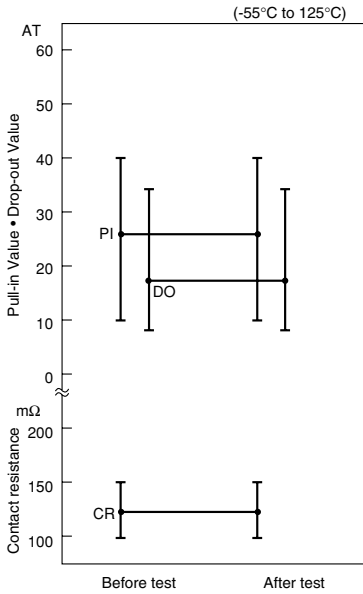
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■ ENVIRONMENTAL CHARACTERISTICS

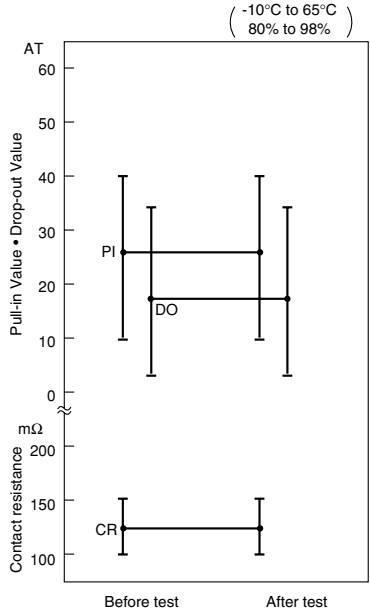
(1) Temperature characteristics



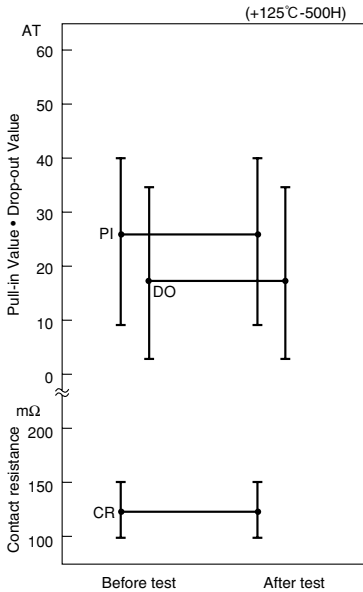
(2) Temperature cycle



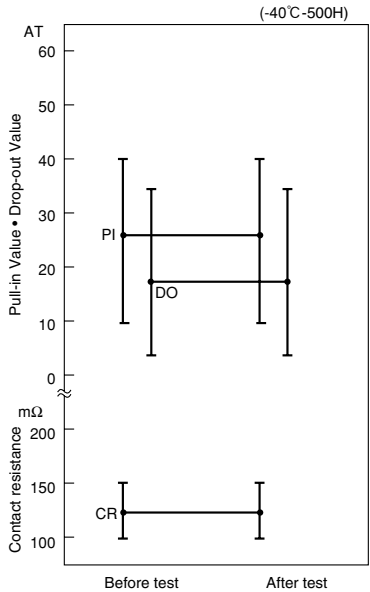
(3) Temperature and humidity cycle



(4) High temperature storage test



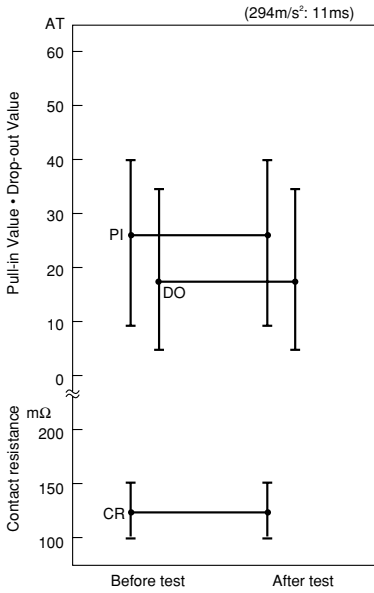
(5) Low temperature storage test



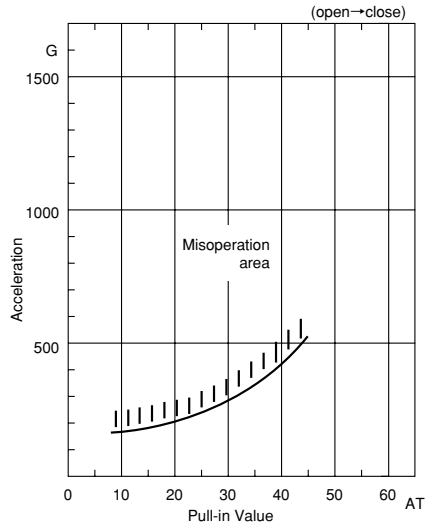
3

(6) Shock test

1) Electrical characteristics

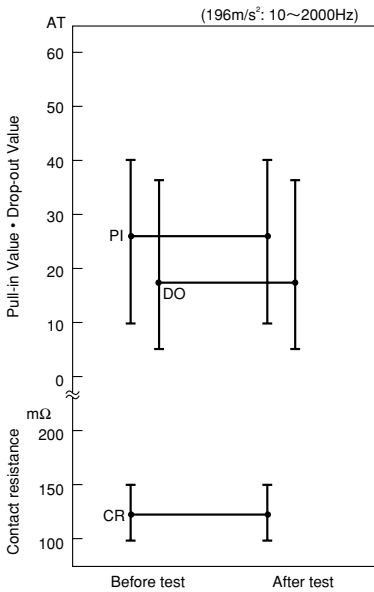


2) Misoperation area



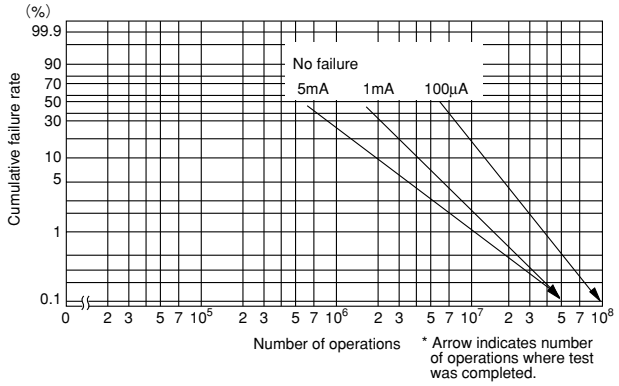
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(7) Vibration test



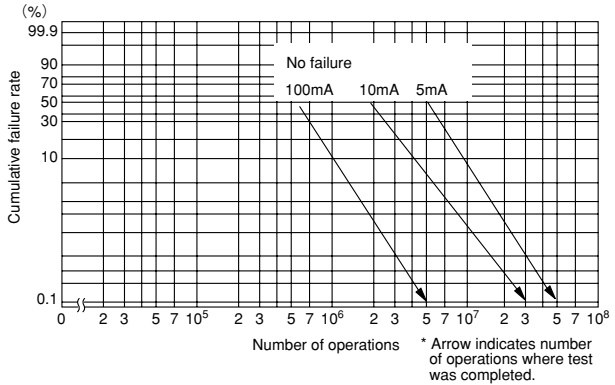
■ LIFE EXPECTANCY DATA: ORD213

Load conditions
 Voltage: 5VDC
 Current: 100 μ A , 1mA , 5mA
 Load: Resistive load

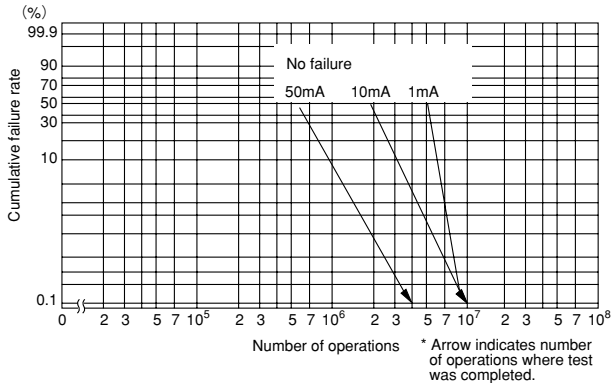


3

Load conditions
 Voltage: 12VDC
 Current: 5mA , 10mA , 100mA
 Load: Resistive load



Load conditions
 Voltage: 24VDC
 Current: 1mA , 10mA , 50mA
 Load: Resistive load



REED SWITCH

ORD219

Miniature High-performance

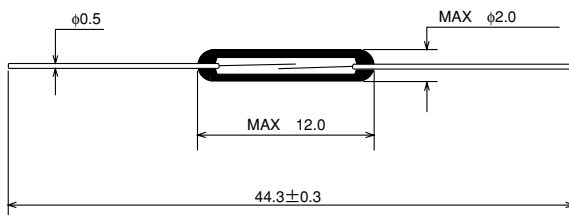
■ GENERAL DESCRIPTION

The ORD219 is a small single-contact reed switch designed for general control of medium-level loads less than 100 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

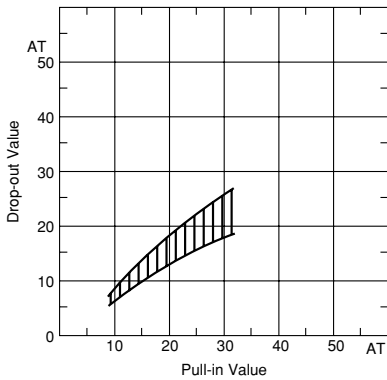
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household Appliances

■ ELECTRICAL CHARACTERISTICS

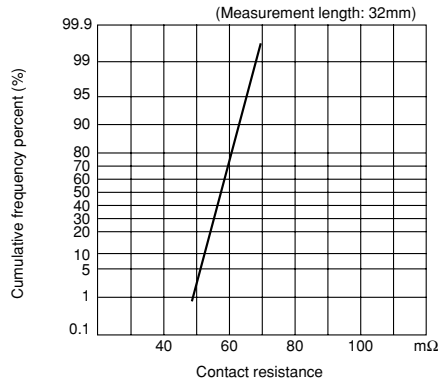
Parameter	Rated value	Unit
Pull-in Value (PI)	10~30	AT
Drop-out Value (DO)	5min	AT
Contact resistance (CR)	100max	mΩ
Breakdown voltage	200min	VDC
Insulation resistance	10 ⁹ min	Ω
Electrostatic capacitance	0.3max	pF
Contact rating	10	VA
Maximum switching voltage	100 ^(DC) / _(AC)	V
Maximum switching current	0.5	A
Maximum carry current	1.0	A

3

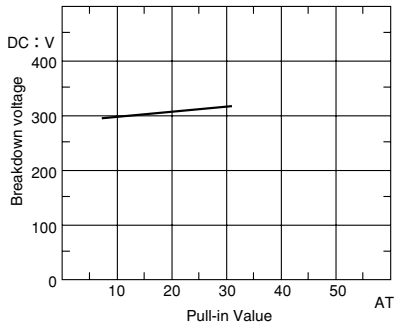
(1) Pull-in Value vs. Drop-out Value



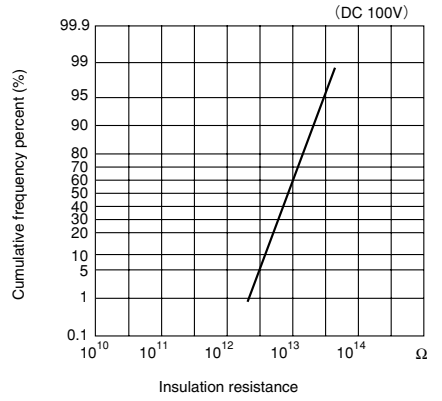
(2) Contact resistance



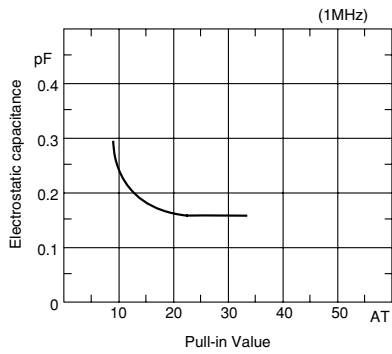
(3) Breakdown voltage



(4) Insulation resistance



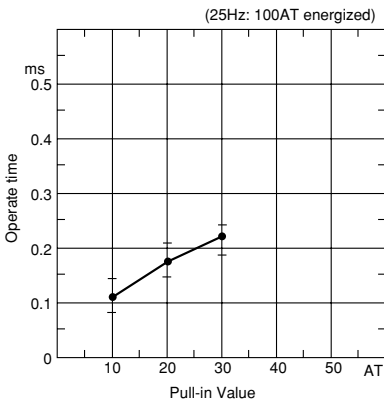
(5) Electrostatic capacitance



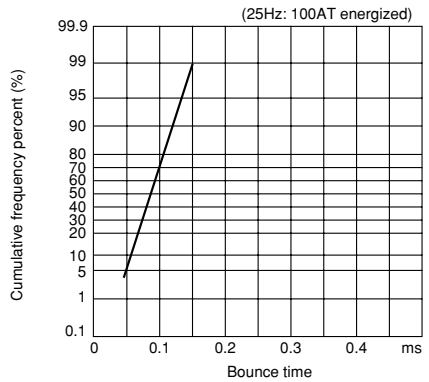
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	0.4max	ms
Bounce time	0.3max	ms
Release time	0.05max	ms
Resonant frequency	5900±400	Hz
Maximum operating frequency	500	Hz

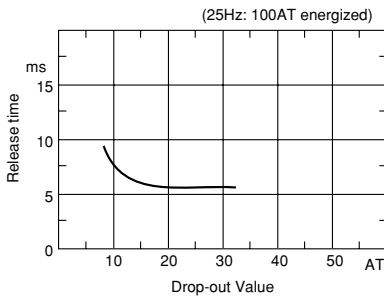
(1) Operate time



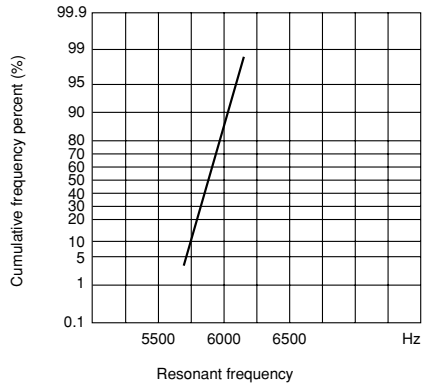
(2) Bounce time



(3) Release time



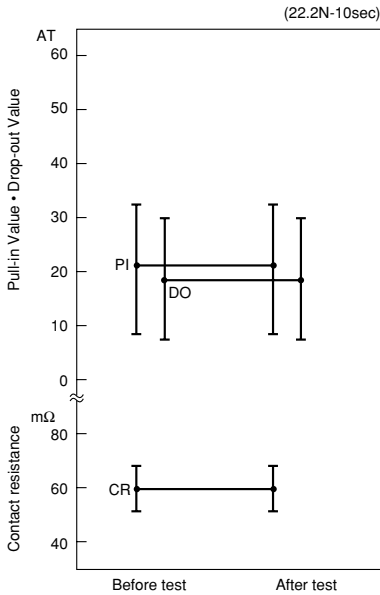
(4) Resonant frequency



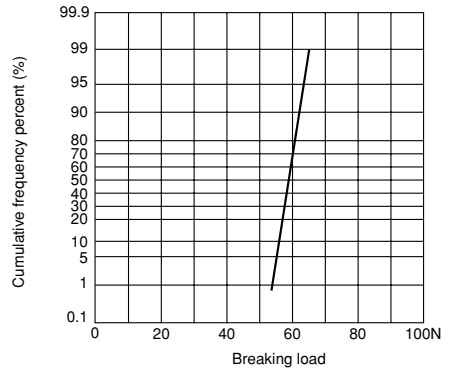
3

■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



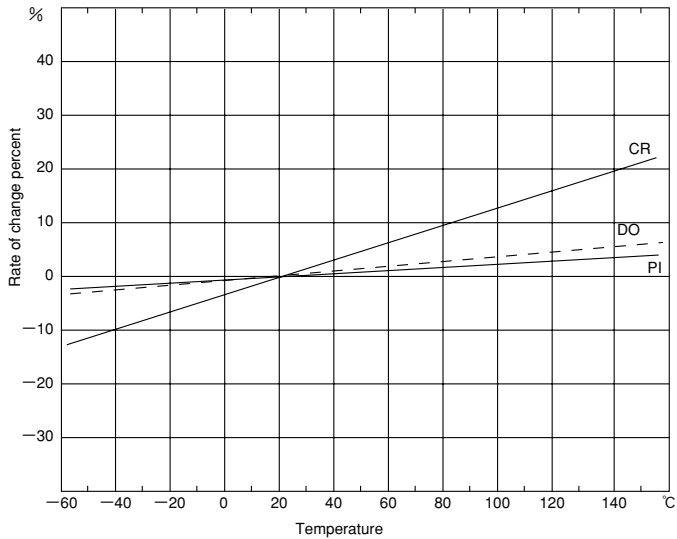
(2) Lead tensile strength



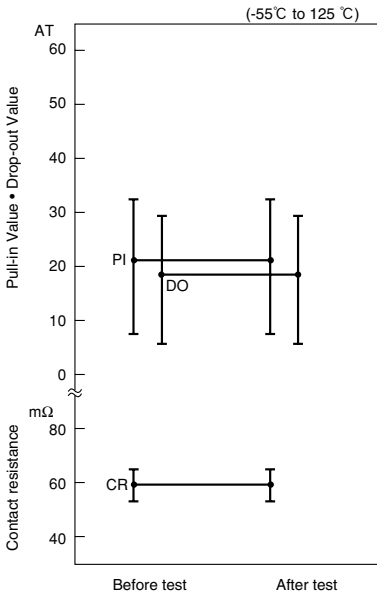
3

■ ENVIRONMENTAL CHARACTERISTICS

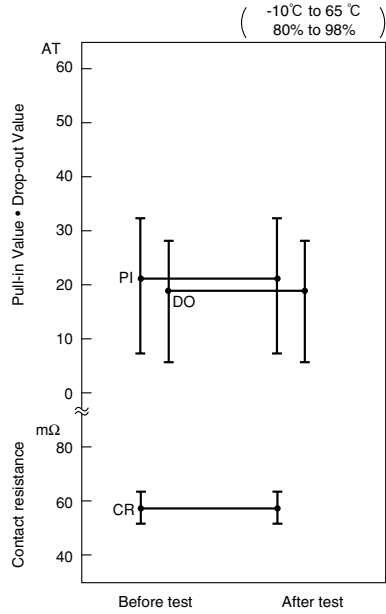
(1) Temperature characteristics



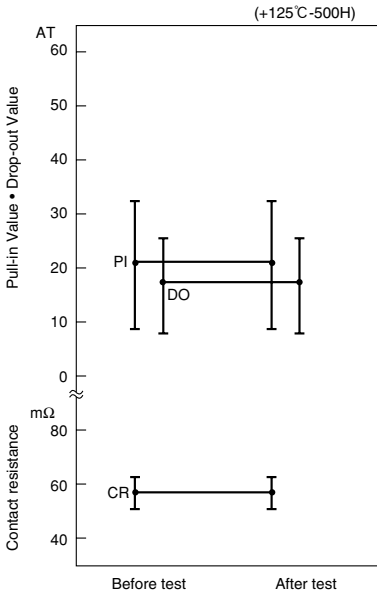
(2) Temperature cycle



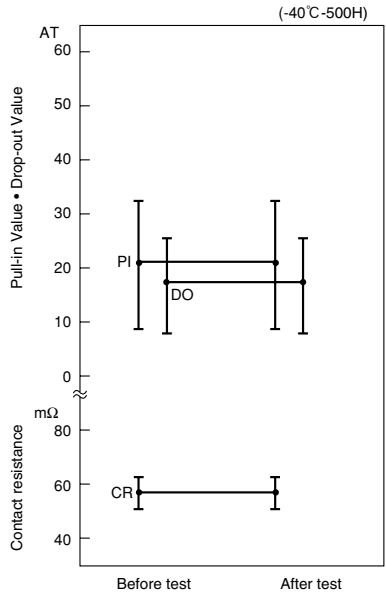
(3) Temperature and humidity cycle



(4) High temperature storage test



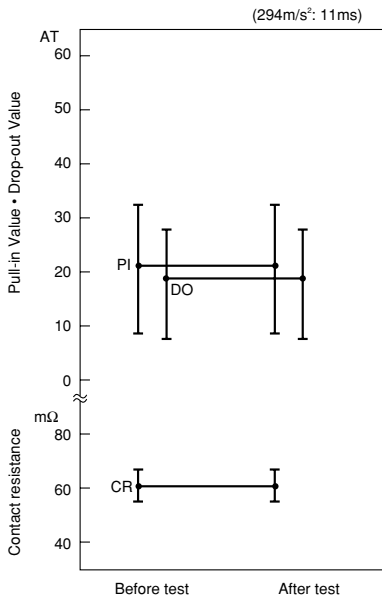
(5) Low temperature storage test



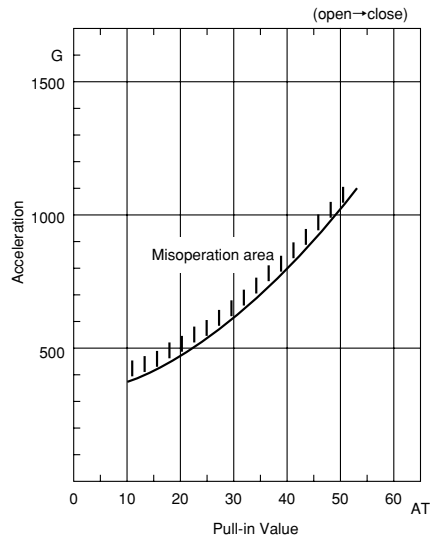
3

(6) Shock test

1) Electrical characteristics

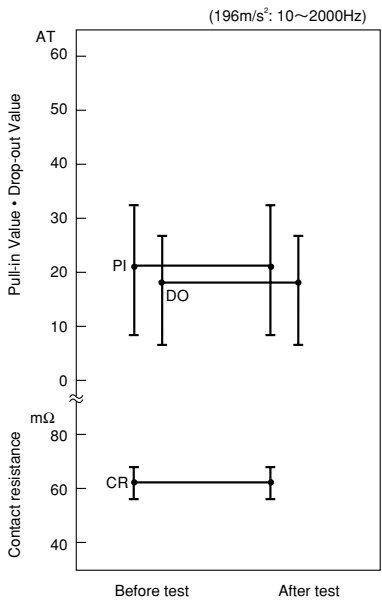


2) Misoperation area



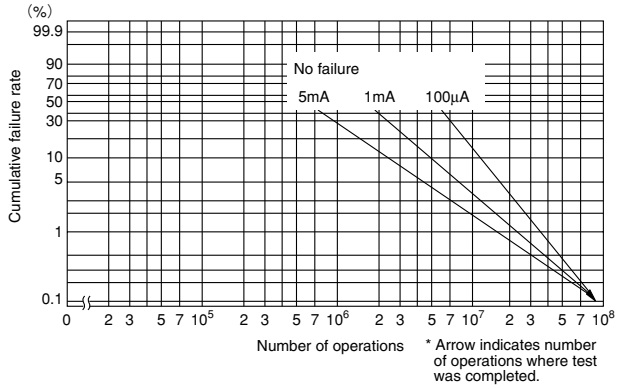
3

(7) Vibration test



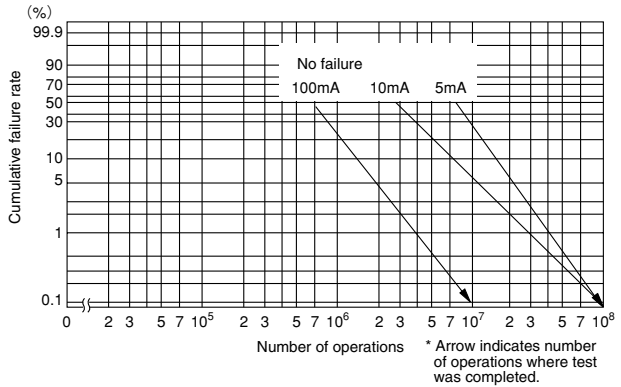
■ LIFE EXPECTANCY DATA: ORD219

Load conditions
 Voltage: 5VDC
 Current: 100 A , 1mA , 5mA
 Load: Resistive load

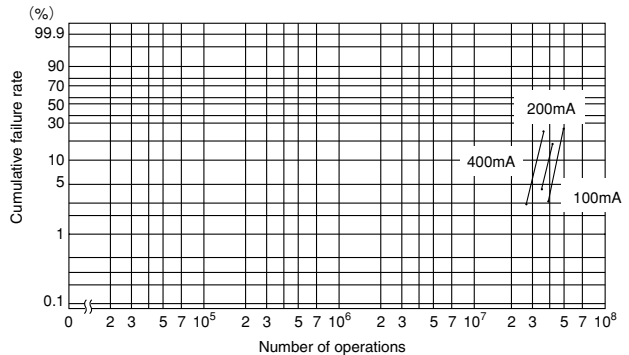


3

Load conditions
 Voltage: 12VDC
 Current: 5mA , 10mA , 100mA
 Load: Resistive load



Load conditions
 Voltage: 24VDC
 Current: 100mA , 200mA , 400mA
 Load: Resistive load



REED SWITCH

ORD221

Miniature Offset-type

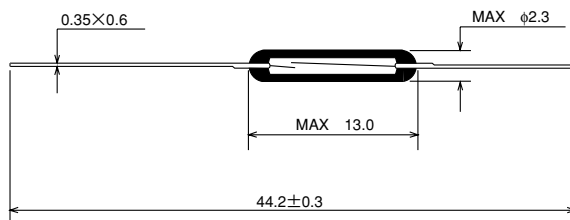
■ GENERAL DESCRIPTION

The ORD221 is a small single-contact reed switch designed for general control of medium-level loads less than 100 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

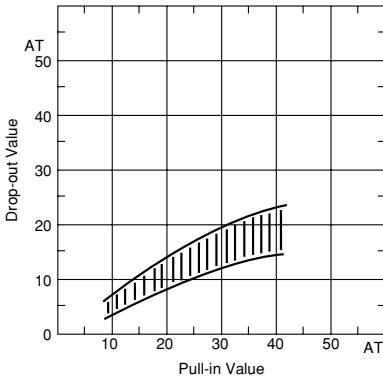
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

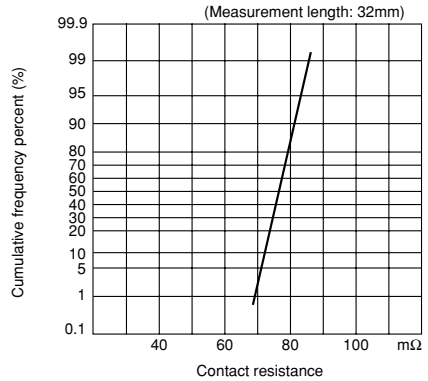
Parameter	Rated value	Unit
Pull-in Value (PI)	10~30	AT
Drop-out Value (DO)	5min	AT
Contact resistance (CR)	100max	mΩ
Breakdown voltage	200 min ($PI \geq 20$)	VDC
	150min ($10 \leq PI < 20$)	VDC
Insulation resistance	10^9 min	Ω
Electrostatic capacitance	0.3max	pF
Contact rating	10	VA
Maximum switching voltage	100 $\left(\frac{DC}{AC}\right)$	V
Maximum switching current	0.3	A
Maximum carry current	1.0	A

3

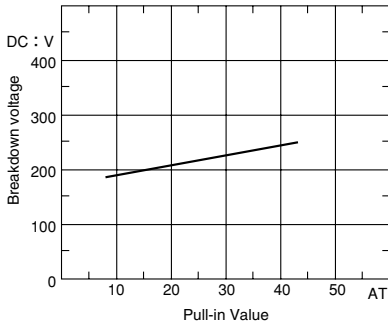
(1) Pull-in Value vs. Drop-out Value



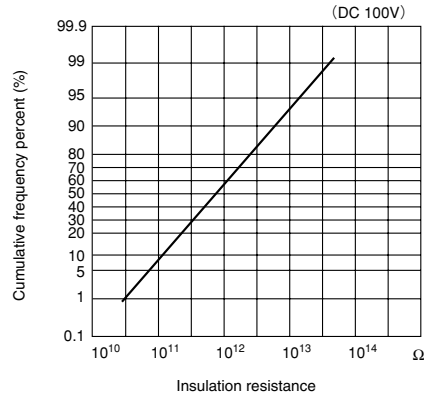
(2) Contact resistance



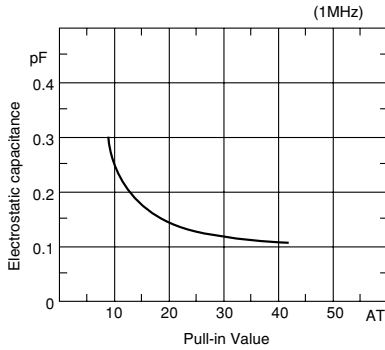
(3) Breakdown voltage



(4) Insulation resistance



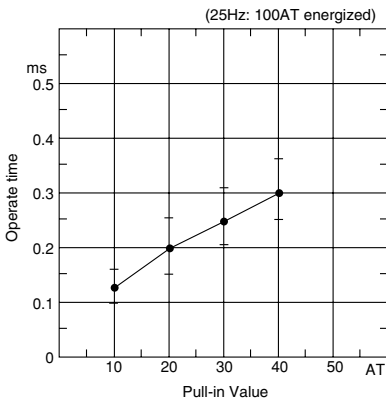
(5) Electrostatic capacitance



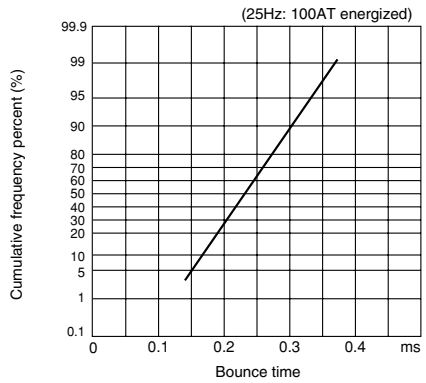
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	0.4max	ms
Bounce time	0.5max	ms
Release time	0.05max	ms
Resonant frequency	2750±250	Hz
Maximum operating frequency	500	Hz

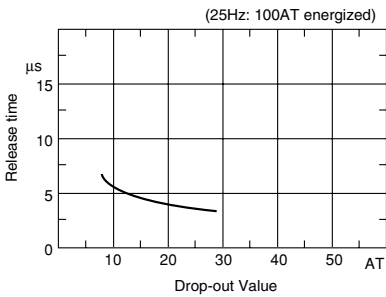
(1) Operate time



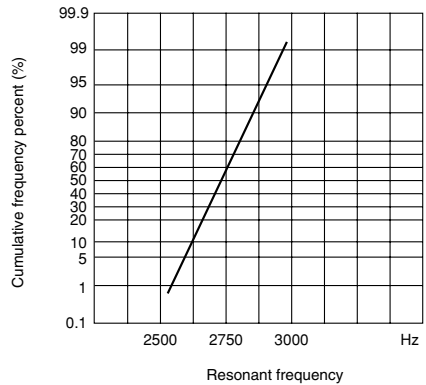
(2) Bounce time



(3) Release time



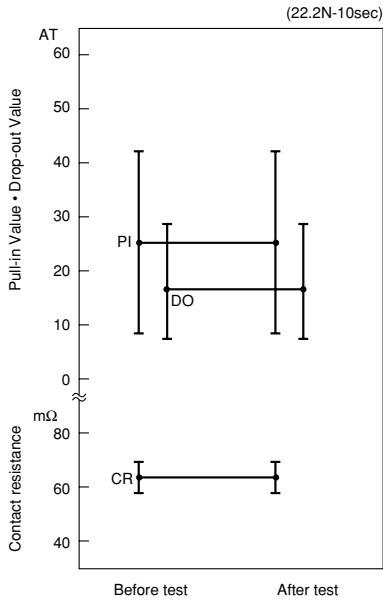
(4) Resonant frequency



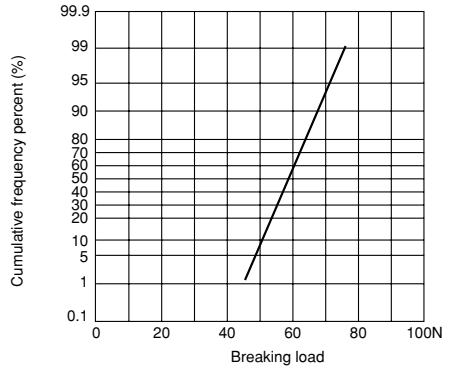
3

■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



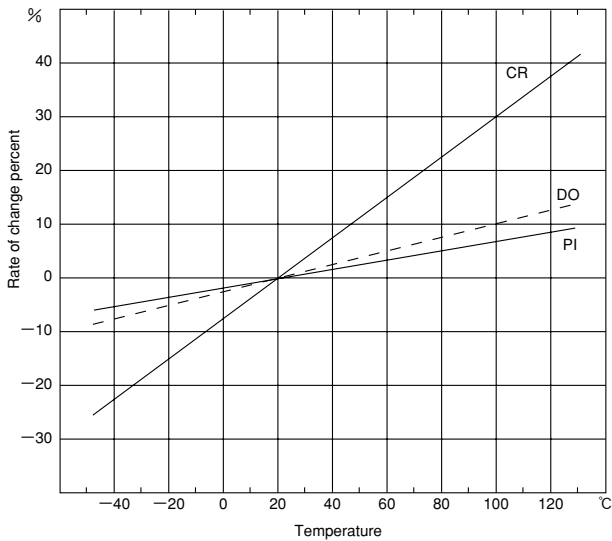
(2) Lead tensile strength



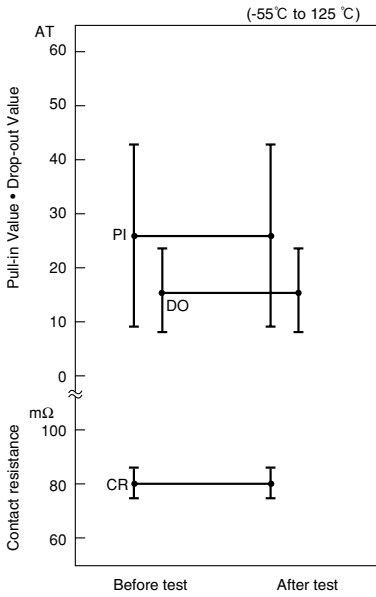
3

■ ENVIRONMENTAL CHARACTERISTICS

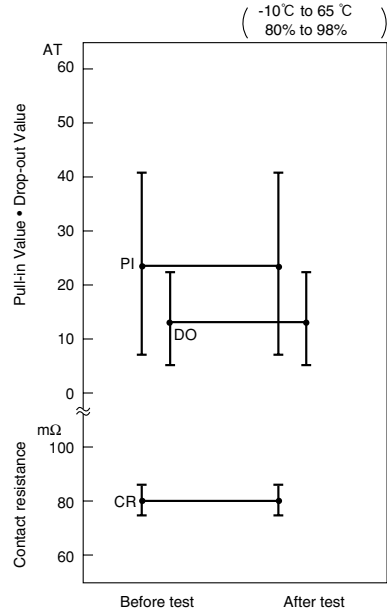
(1) Temperature characteristics



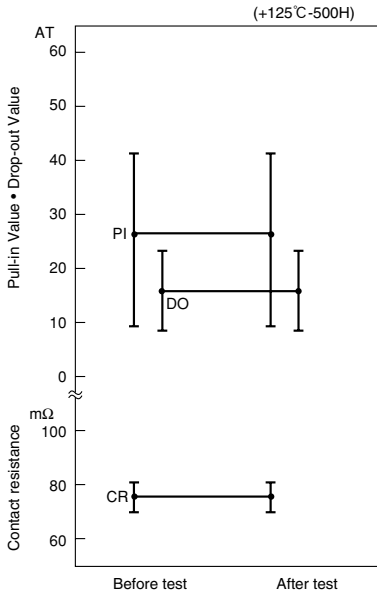
(2) Temperature cycle



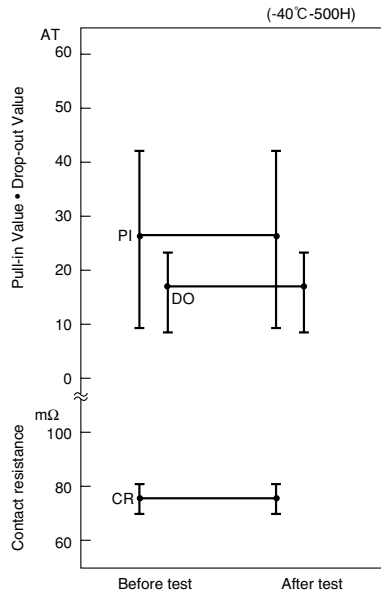
(3) Temperature and humidity cycle



(4) High temperature storage test



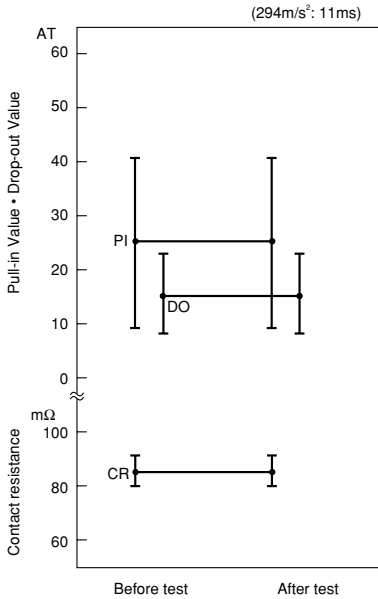
(5) Low temperature storage test



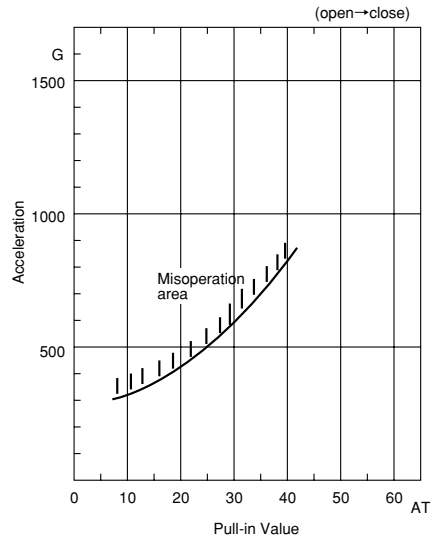
3

(6) Shock test

1) Electrical characteristics

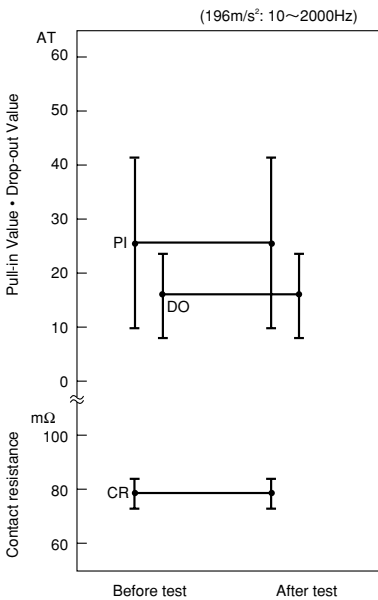


2) Misoperation area



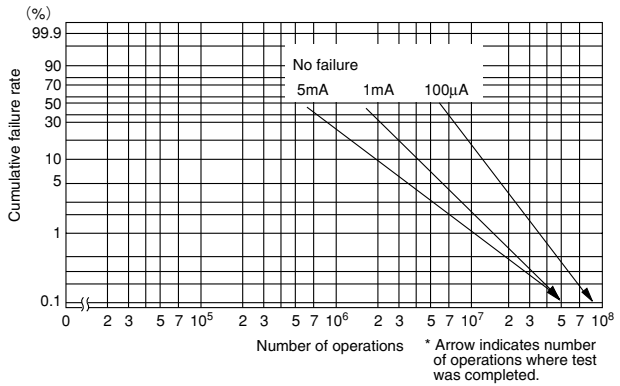
3

(7) Vibration test



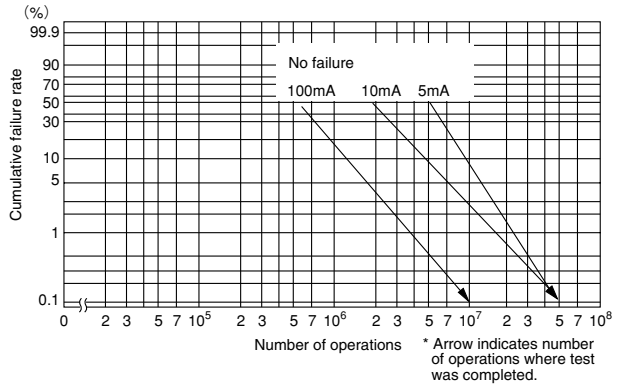
■ LIFE EXPECTANCY DATA: ORD221

Load conditions
 Voltage: 5VDC
 Current: 100 A, 1mA, 5mA
 Load: Resistive load

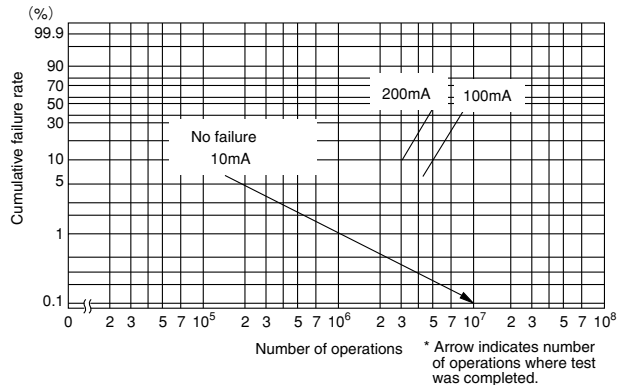


3

Load conditions
 Voltage: 12VDC
 Current: 5mA, 10mA, 100mA
 Load: Resistive load



Load conditions
 Voltage: 24VDC
 Current: 10mA, 100mA, 200mA
 Load: Resistive load



REED SWITCH

ORD228VL

Miniature High-performance

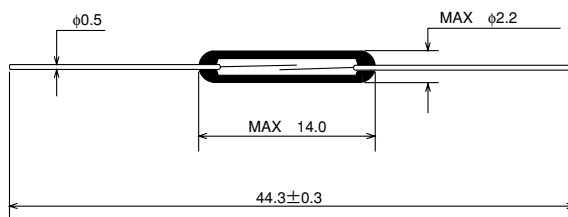
■ GENERAL DESCRIPTION

The ORD228VL is a small single-contact reed switch designed for general control of medium level loads less than 100 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

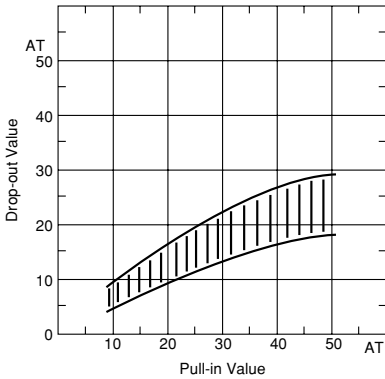
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

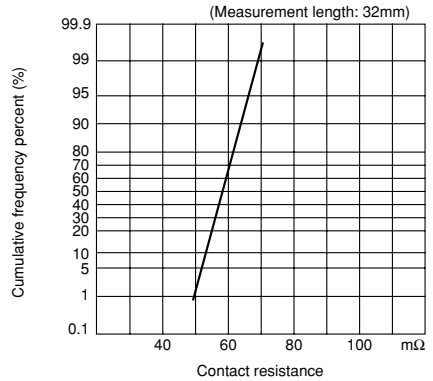
Parameter	Rated value	Unit
Pull-in Value (PI)	10~50	AT
Drop-out Value (DO)	5min	AT
Contact resistance (CR)	100max	mΩ
Breakdown voltage	200 min ($PI \geq 20$)	VDC
	150 min ($10 \leq PI < 20$)	VDC
Insulation resistance	10^9 min	Ω
Electrostatic capacitance	0.3max	pF
Contact rating	10	VA
Maximum switching voltage	100 $\frac{DC}{AC}$	V
Maximum switching current	0.5	A
Maximum carry current	1.0	A

3

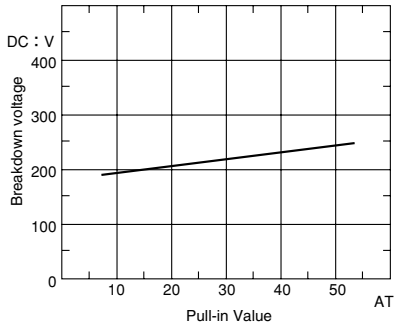
(1) Pull-in Value vs. Drop-out Value



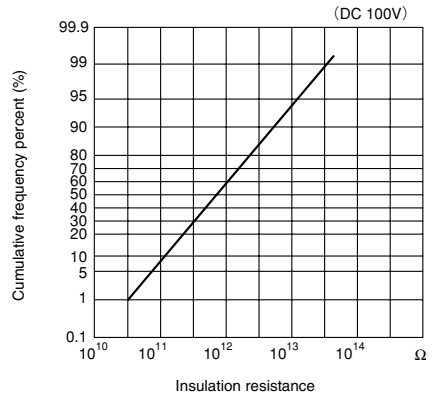
(2) Contact resistance



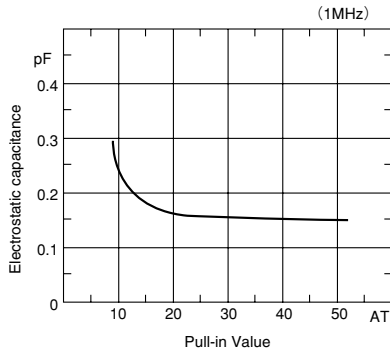
(3) Breakdown voltage



(4) Insulation resistance



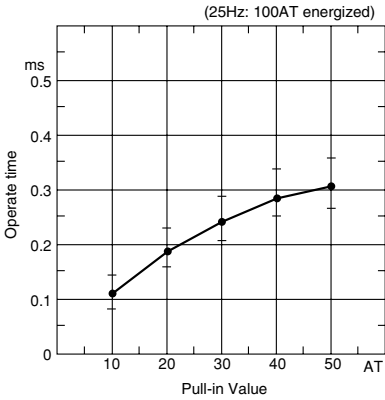
(5) Electrostatic capacitance



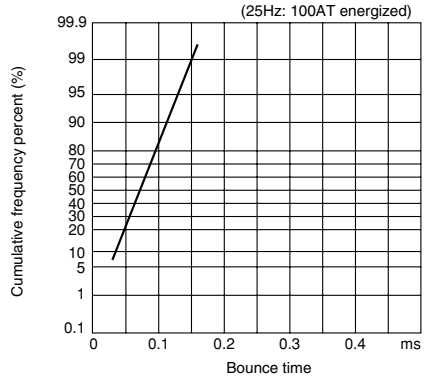
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	0.4max	ms
Bounce time	0.3max	ms
Release time	0.05max	ms
Resonant frequency	5000±400	Hz
Maximum operating frequency	500	Hz

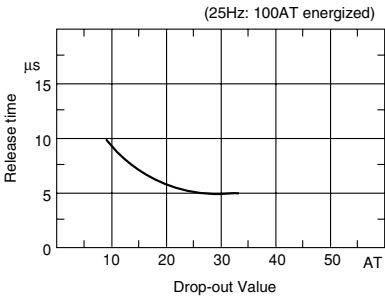
(1) Operate time



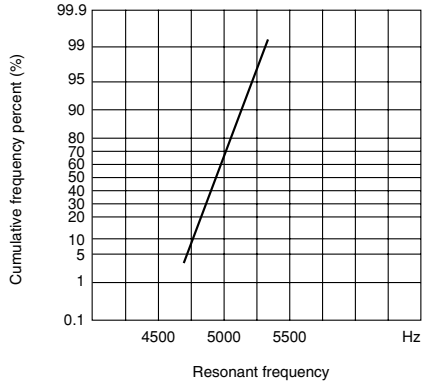
(2) Bounce time



(3) Release time



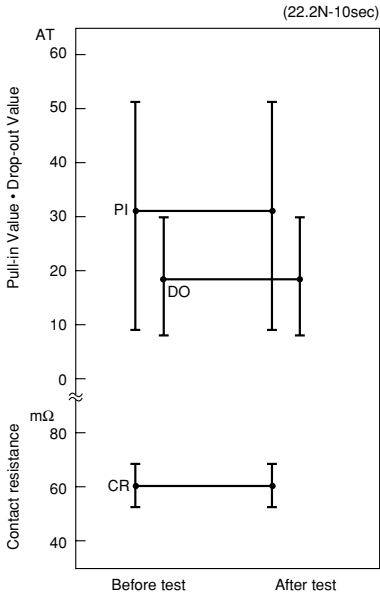
(4) Resonant frequency



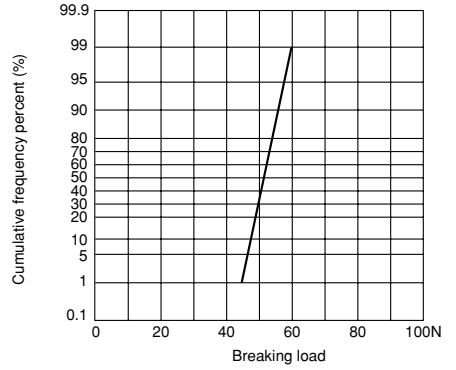
3

■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



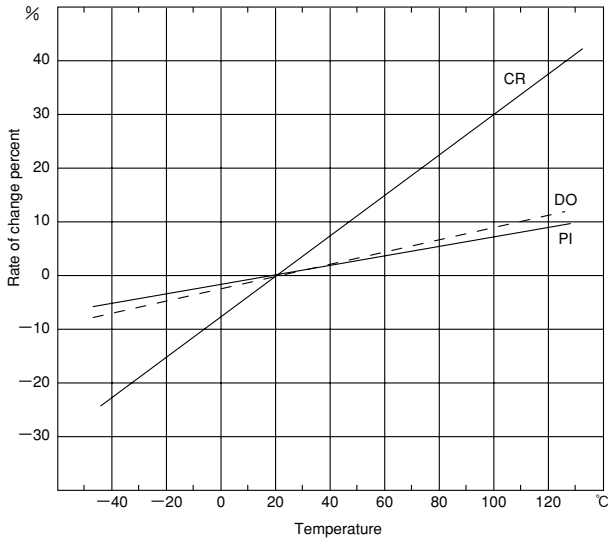
(2) Lead tensile strength



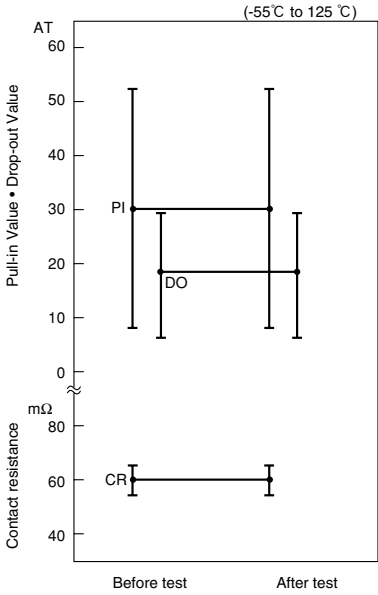
3

■ ENVIRONMENTAL CHARACTERISTICS

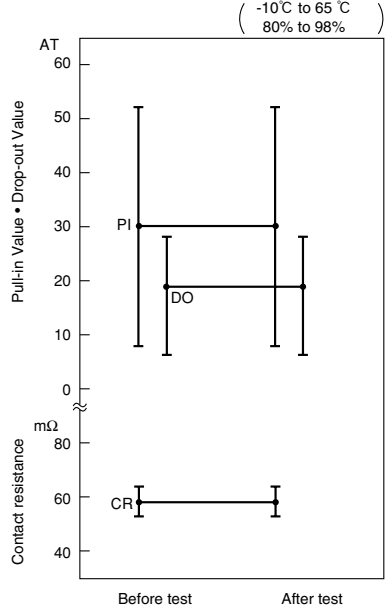
(1) Temperature characteristics



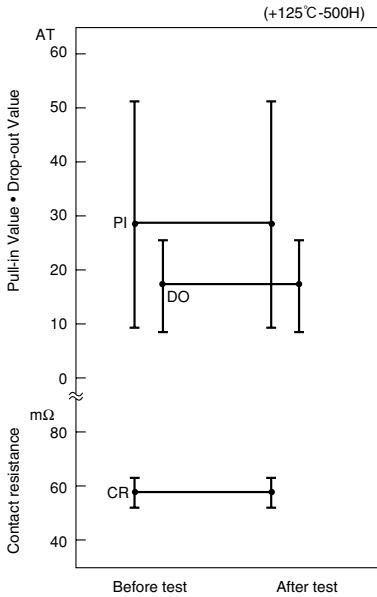
(2) Temperature cycle



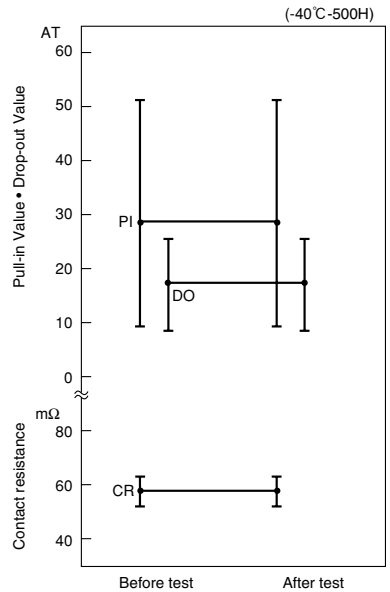
(3) Temperature and humidity cycle



(4) High temperature storage test



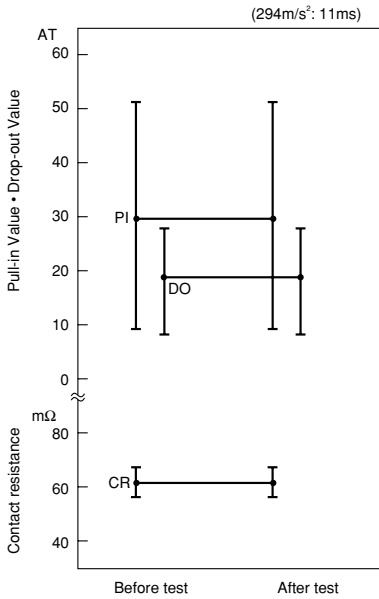
(5) Low temperature storage test



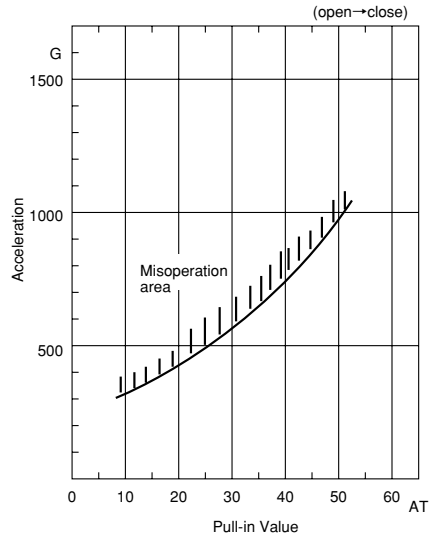
3

(6) Shock test

1) Electrical characteristics

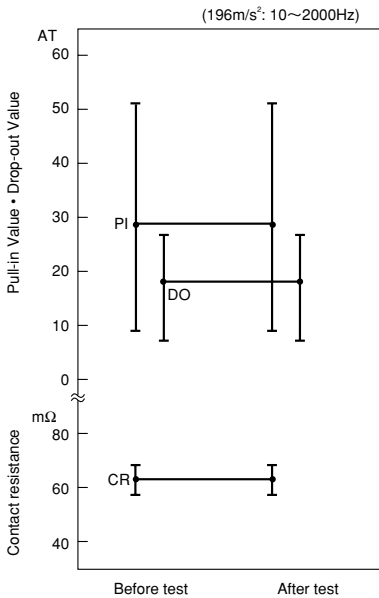


2) Misoperation area



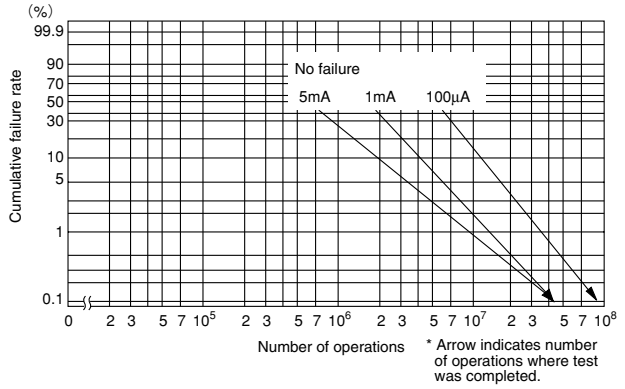
3

(7) Vibration test



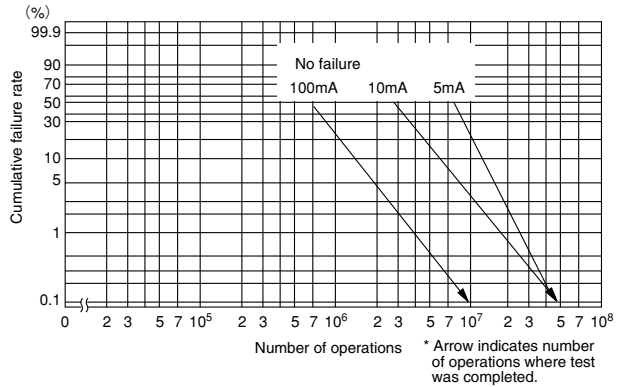
■ LIFE EXPECTANCY DATA: ORD228VL

Load conditions
 Voltage: 5VDC
 Current: 100 A , 1mA , 5mA
 Load: Resistive load

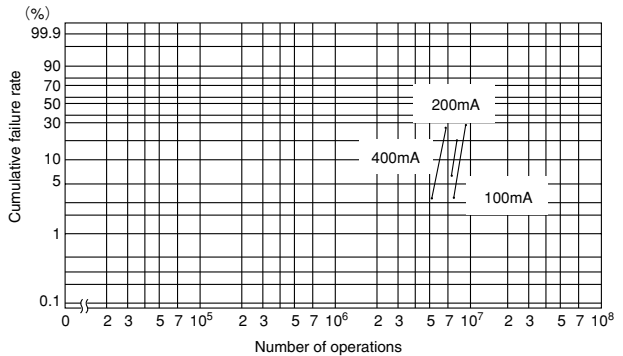


3

Load conditions
 Voltage: 12VDC
 Current: 5mA , 10mA , 100mA
 Load: Resistive load



Load conditions
 Voltage: 24VDC
 Current: 100mA , 200mA , 400mA
 Load: Resistive load



REED SWITCH

ORD2211

Lamp Load

■ GENERAL DESCRIPTION

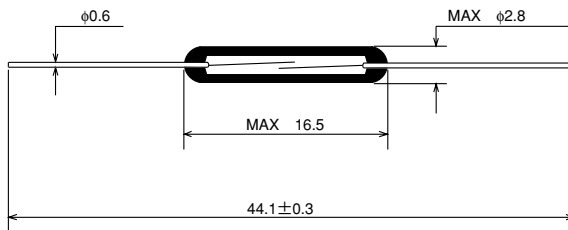
The ORD2211 is a single-contact reed switch designed for direct opening or closing lamps of 12 V - 3.4 W. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

3

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

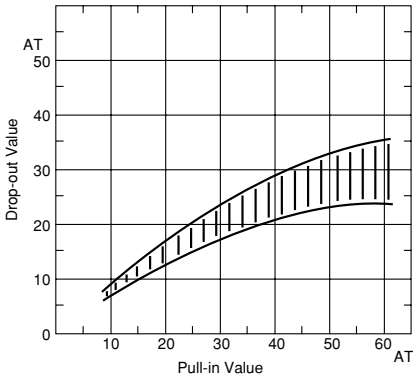
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

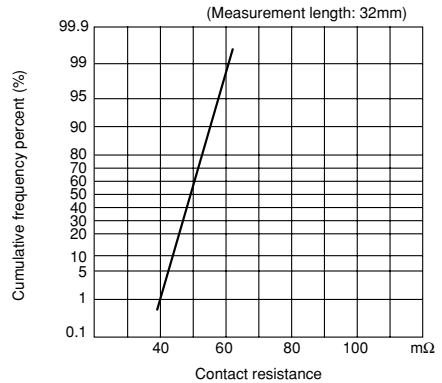
Parameter	Rated value	Unit
Pull-in Value (PI)	20~60	AT
Drop-out Value (DO)	8min	AT
Contact resistance (CR)	100max	mΩ
Breakdown voltage	200min	VDC
Insulation resistance	10 ⁹ min	Ω
Electrostatic capacitance	0.3max	pF
Contact rating	50 (12V-3.4W lamp)	VA
Maximum switching voltage	100 (^{DC} / _{AC})	V
Maximum switching current	0.5 (Inrush 3A)	A
Maximum carry current	2.5	A

3

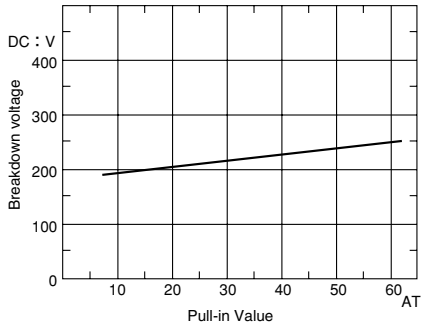
(1) Pull-in Value vs. Drop-out Value



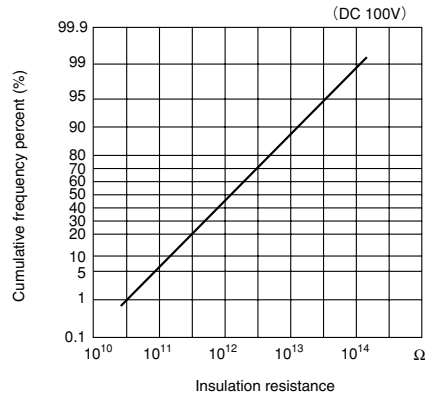
(2) Contact resistance



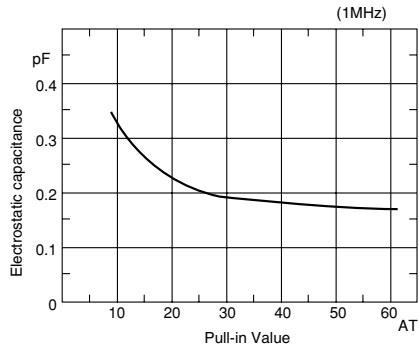
(3) Breakdown voltage



(4) Insulation resistance



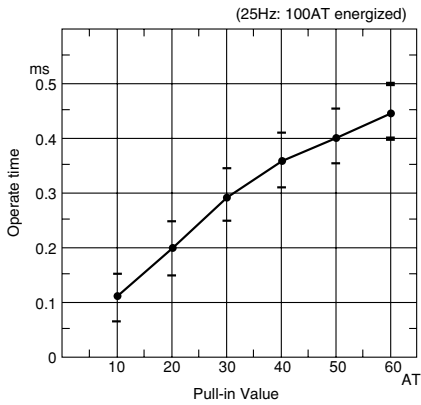
(5) Electrostatic capacitance



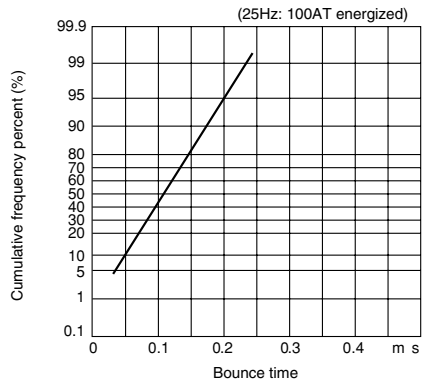
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	0.6max	ms
Bounce time	0.4max	ms
Release time	0.05max	ms
Resonant frequency	4600±500	Hz
Maximum operating frequency	500	Hz

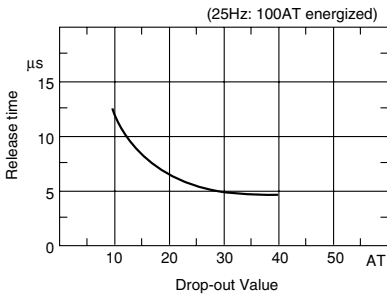
(1) Operate time



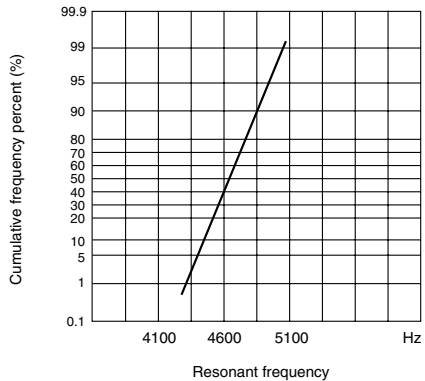
(2) Bounce time



(3) Release time



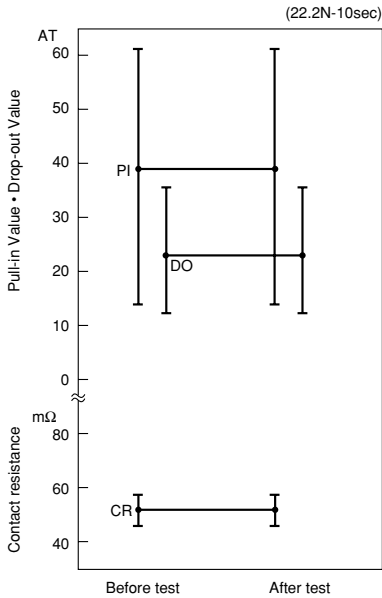
(4) Resonant frequency



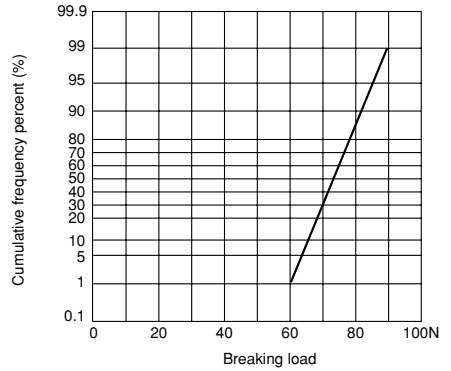
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■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



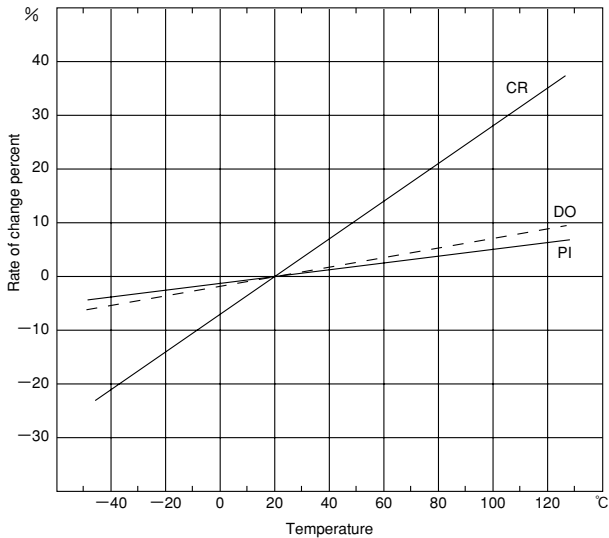
(2) Lead tensile strength



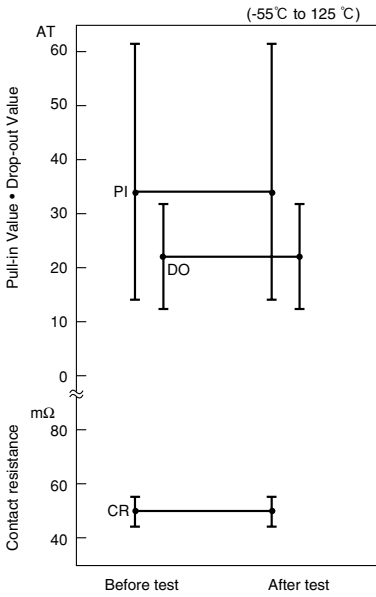
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■ ENVIRONMENTAL CHARACTERISTICS

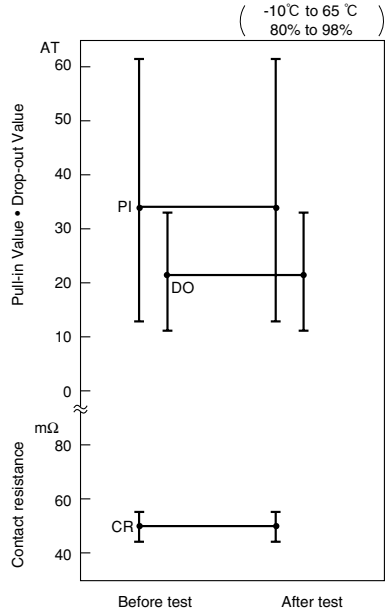
(1) Temperature characteristics



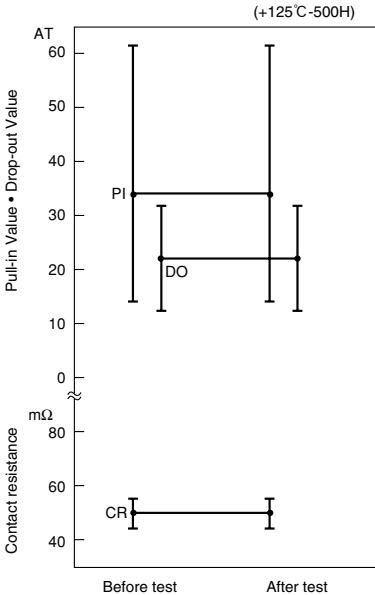
(2) Temperature cycle



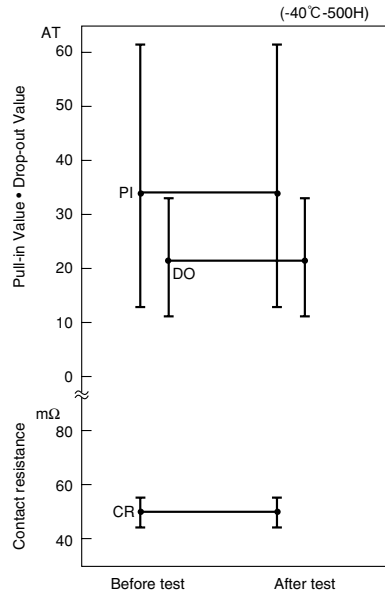
(3) Temperature and humidity cycle



(4) High temperature storage test



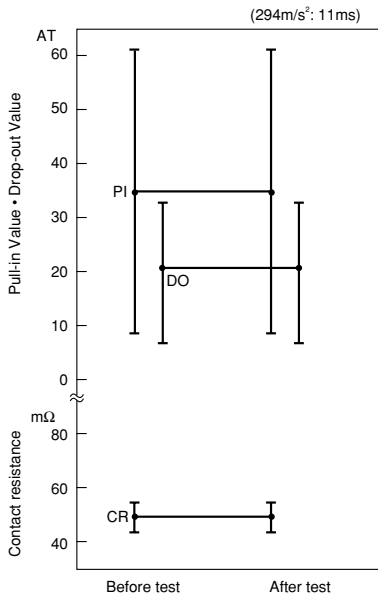
(5) Low temperature storage test



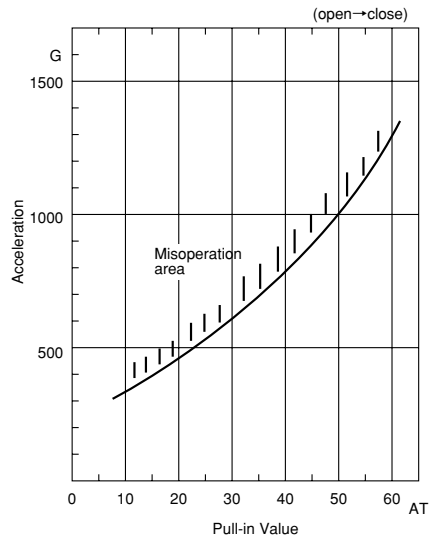
3

(6) Shock test

1) Electrical characteristics

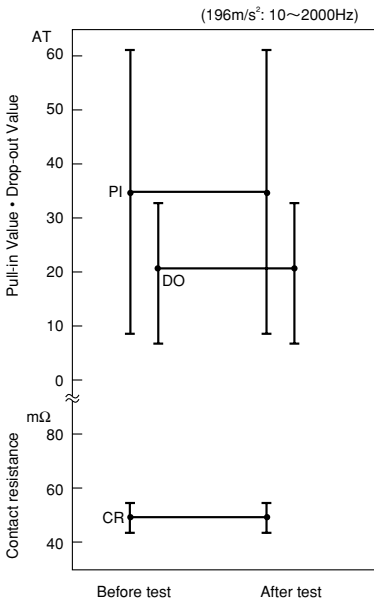


2) Misoperation area



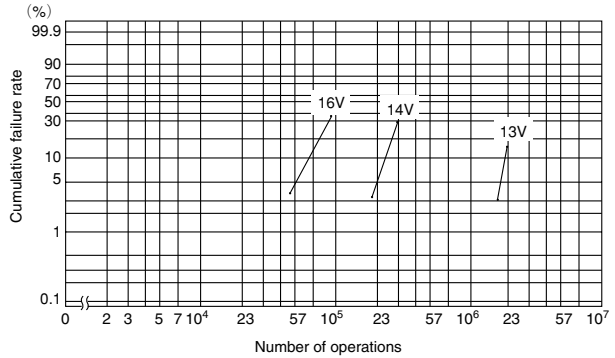
3

(7) Vibration test



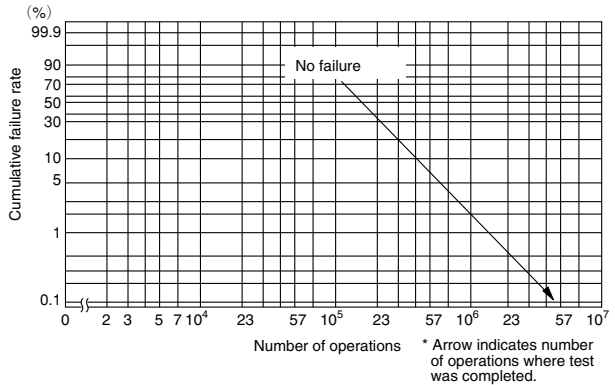
■ LIFE EXPECTANCY DATA: ORD2211

Load conditions
 Voltage: 13, 14, 16 : VDC
 Current: 12V-3.4W Lamp

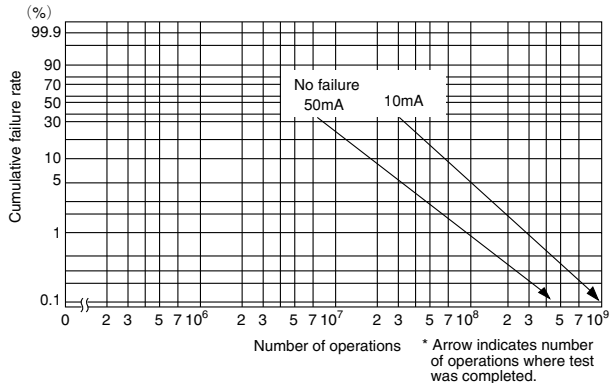


3

Load conditions
 Voltage: 50VDC
 Current: 1A
 Load: Resistive load



Load conditions
 Voltage: 6VDC
 Current: 10mA, 50mA
 Load: Resistive load



REED SWITCH

ORD2212

Closed Differential, Low Operating Noise

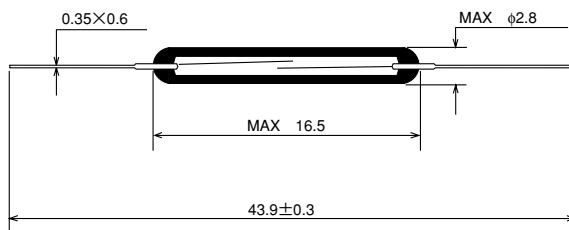
■ GENERAL DESCRIPTION

The ORD2212 is a single-contact reed switch designed for the purpose of low operating noise and closed differential motion. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

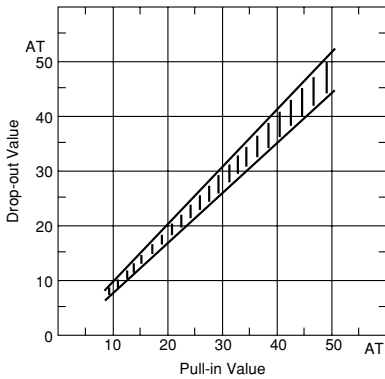
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

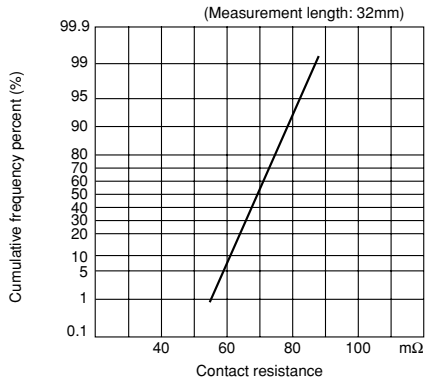
Parameter	Rated value	Unit
Pull-in Value (PI)	15~45	AT
Drop-out Value (DO)	$DO/PI \geq 0.8$ ($PI \geq 20$)	
	$DO/PI \geq 0.7$ ($15 \leq PI < 20$)	
Contact resistance (CR)	100max	mΩ
Breakdown voltage	150min	VDC
Insulation resistance	10^9 min	Ω
Electrostatic capacitance	0.5max	pF
Contact rating	10	VA
Maximum switching voltage	100 ^(DC) / _(AC)	V
Maximum switching current	0.2	A
Maximum carry current	0.5	A

3

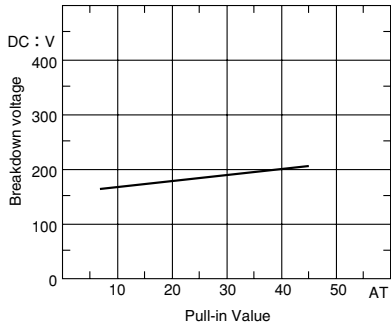
(1) Pull-in Value vs. Drop-out Value



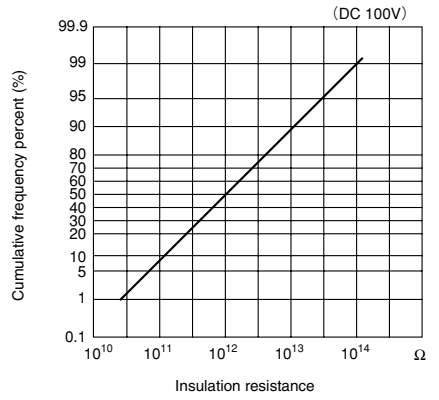
(2) Contact resistance



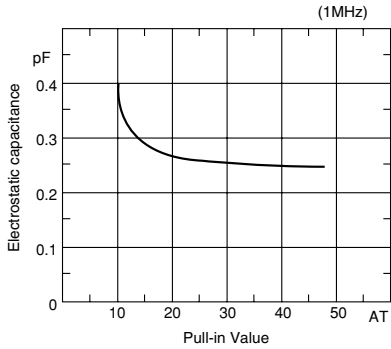
(3) Breakdown voltage



(4) Insulation resistance



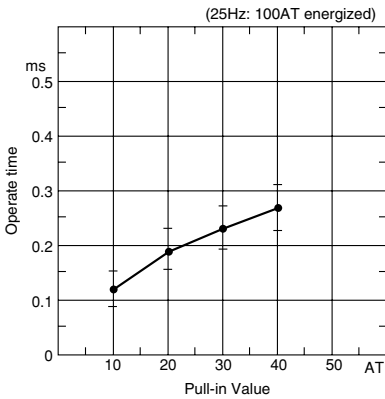
(5) Electrostatic capacitance



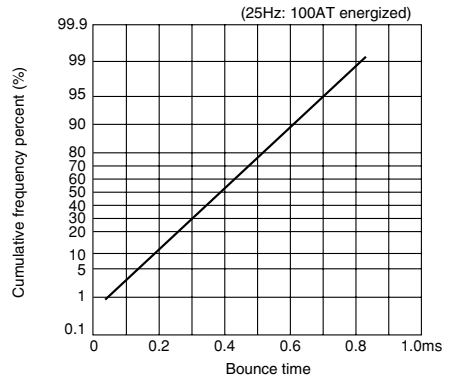
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	0.4max	ms
Bounce time	1.0max	ms
Release time	0.05max	ms
Resonant frequency	3900±500	Hz
Maximum operating frequency	500	Hz

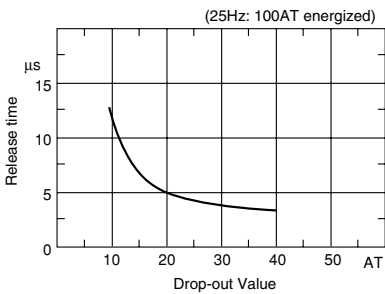
(1) Operate time



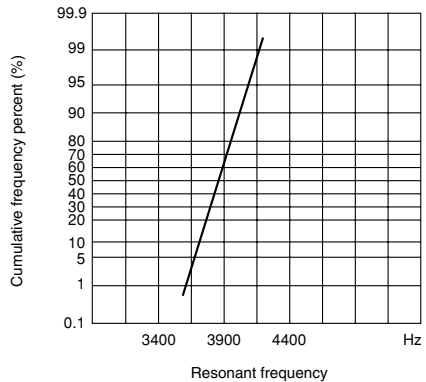
(2) Bounce time



(3) Release time



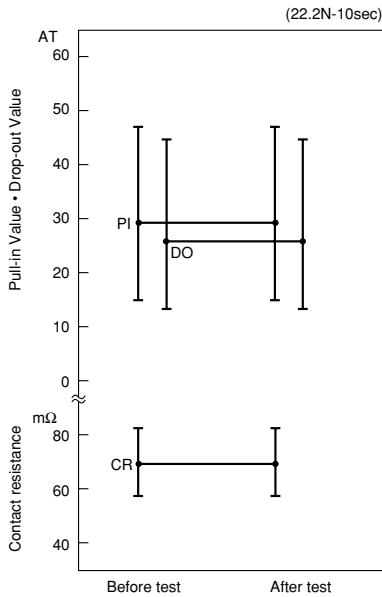
(4) Resonant frequency



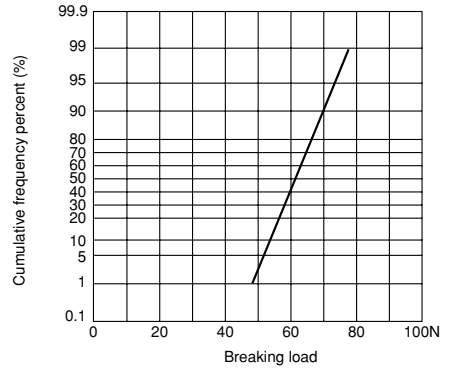
3

■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



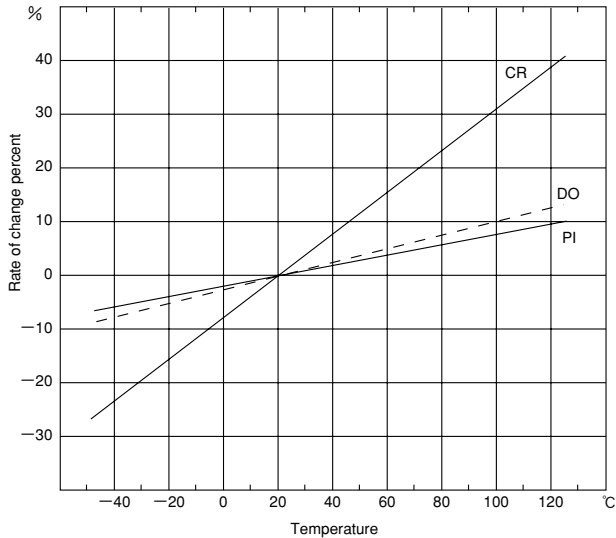
(2) Lead tensile strength



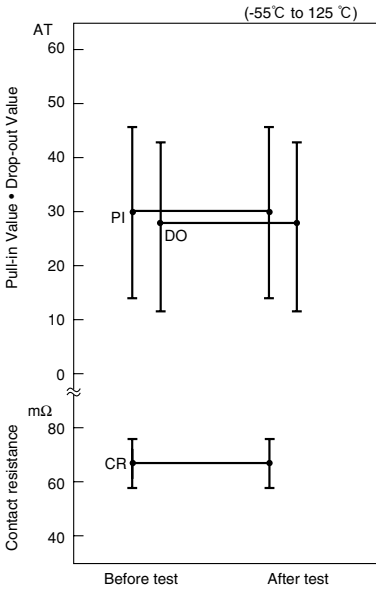
3

■ ENVIRONMENTAL CHARACTERISTICS

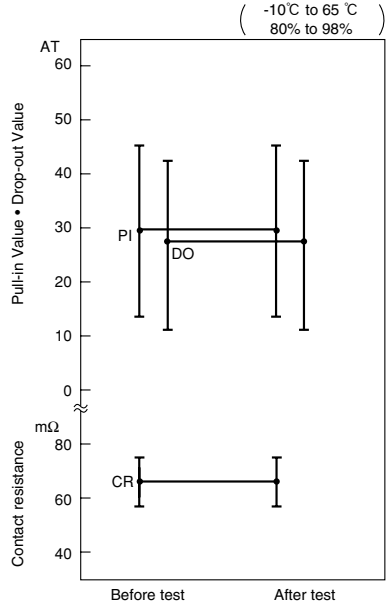
(1) Temperature characteristics



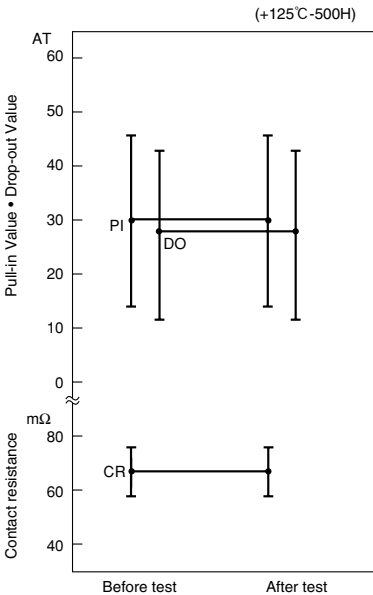
(2) Temperature cycle



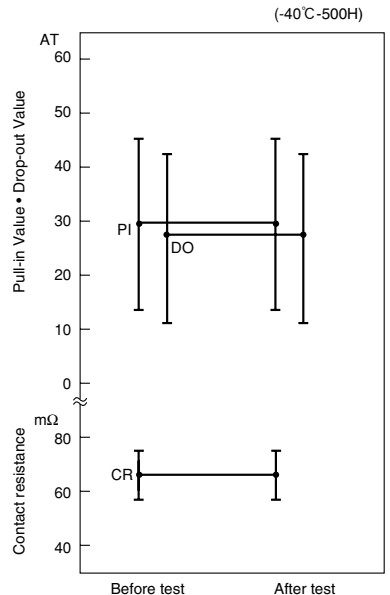
(3) Temperature and humidity cycle



(4) High temperature storage test



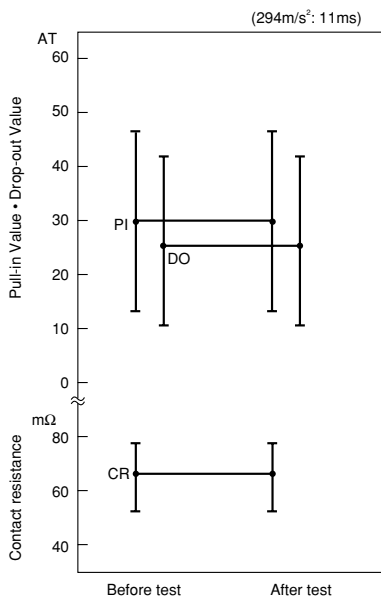
(5) Low temperature storage test



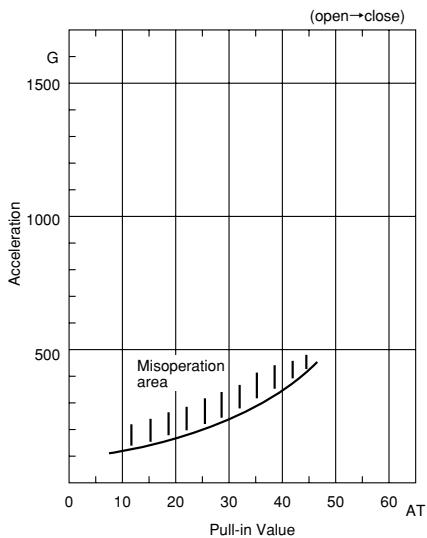
3

(6) Shock test

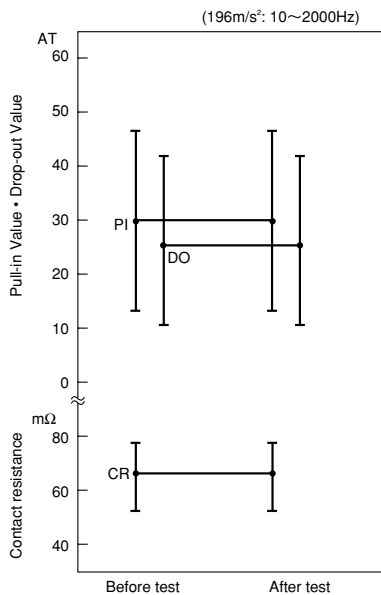
1) Electrical characteristics



2) Misoperation area

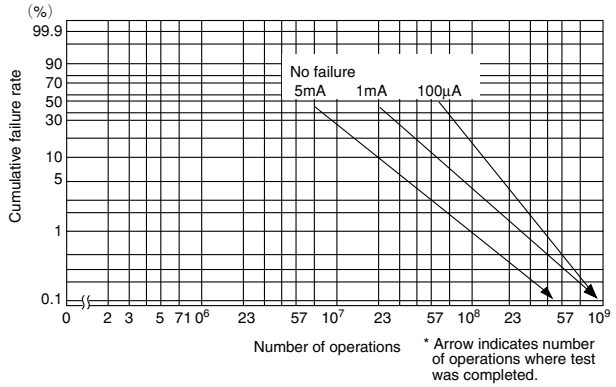


(7) Vibration test



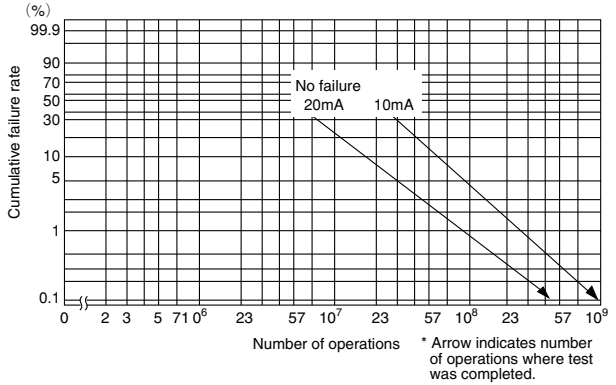
■ LIFE EXPECTANCY DATA: ORD2212

Load conditions
 Voltage: 5VDC
 Current: 100µA, 1mA, 5mA
 Load: Resistive load

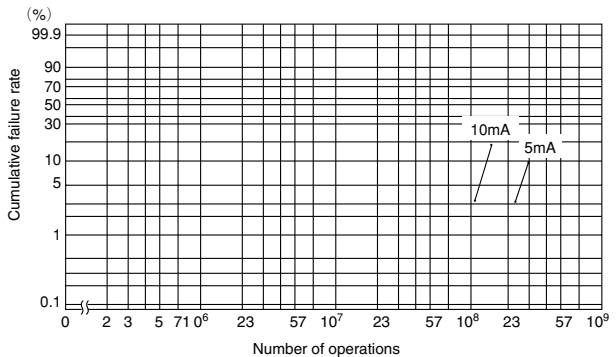


3

Load conditions
 Voltage: 6VDC
 Current: 10mA, 20mA
 Load: Resistive load



Load conditions
 Voltage: 15VDC
 Current: 5mA, 10mA
 Load: Resistive load



REED SWITCH

ORD229

High Breakdown Voltage

■ GENERAL DESCRIPTION

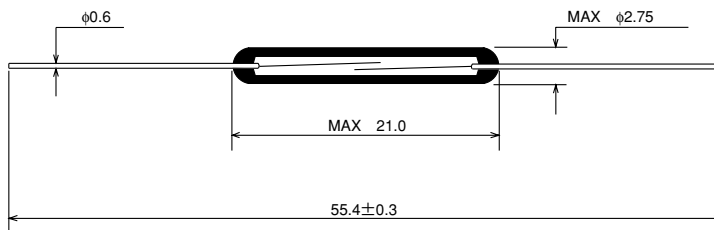
The ORD229 is a single-contact reed switch designed for high breakdown voltage of 600 VDC and high power of AC 70 VA and DC 50 W. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises an operating system and electrical circuits coaxially. Reed switches are suited to applications in radio frequency.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

3

■ EXTERNAL DIMENSIONS (Unit: mm)



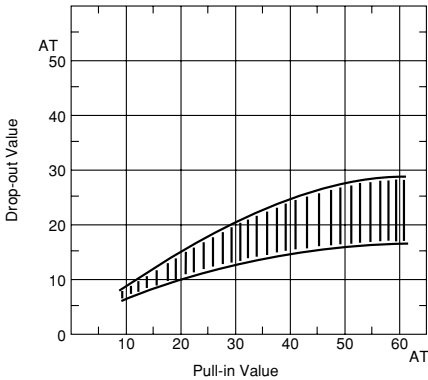
■ APPLICATIONS

- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

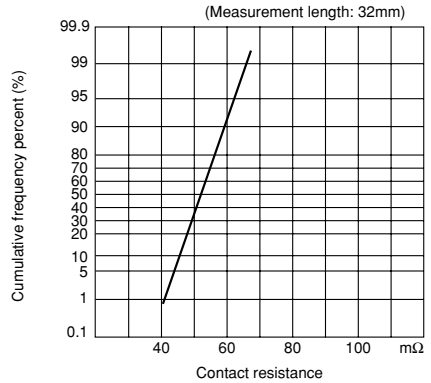
■ ELECTRICAL CHARACTERISTICS

Parameter	Rated value	Unit
Pull-in Value (PI)	20~60	AT
Drop-out Value (DO)	6min	AT
Contact resistance (CR)	100	mΩ
Breakdown voltage	600 min ($PI \geq 35$)	VDC
	500 min ($20 \leq PI < 35$)	VDC
Insulation resistance	10^{10} min	Ω
Electrostatic capacitance	0.5max	pF
Contact rating	50	W
	70	VA
Maximum switching voltage	300AC	V
	350DC	V
Maximum switching current	DC0.7	A
	AC0.5	A
Maximum carry current	2.5	A

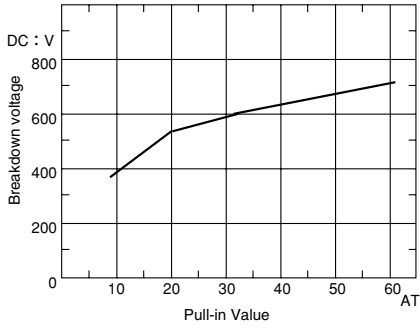
(1) Pull-in Value vs. Drop-out Value



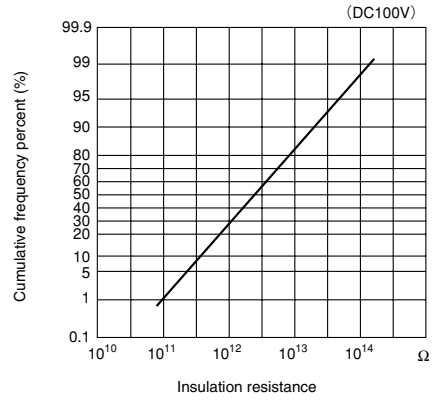
(2) Contact resistance



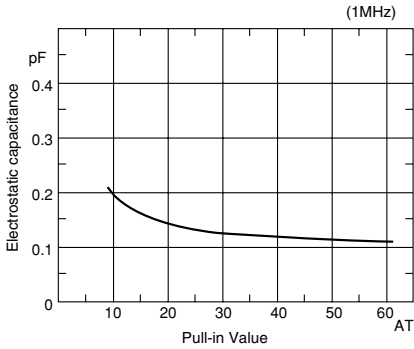
(3) Breakdown voltage



(4) Insulation resistance



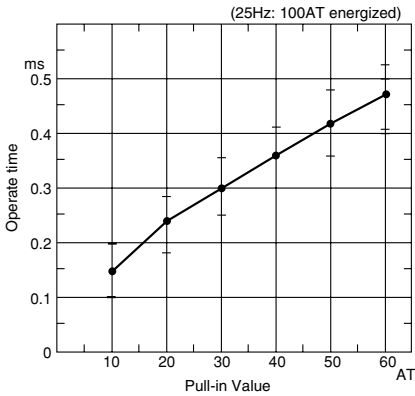
(5) Electrostatic capacitance



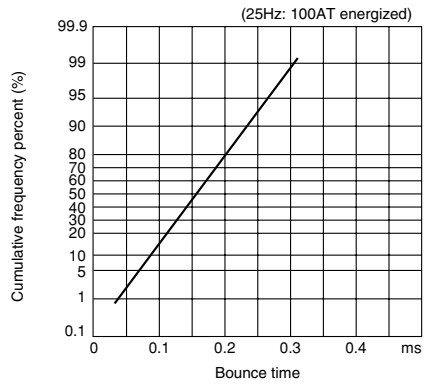
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	0.6max	ms
Bounce time	0.5max	ms
Release time	0.05max	ms
Resonant frequency	2500±250	Hz
Maximum operating frequency	500	Hz

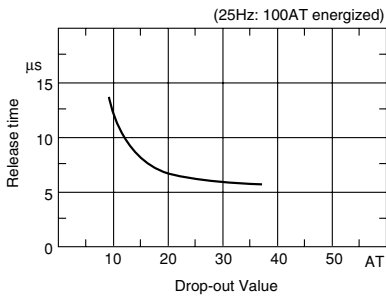
(1) Operate time



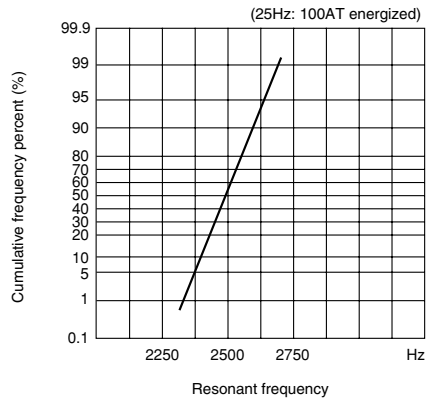
(2) Bounce time



(3) Release time



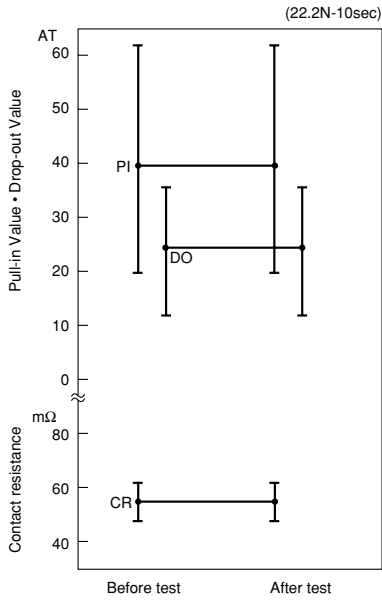
(4) Resonant frequency



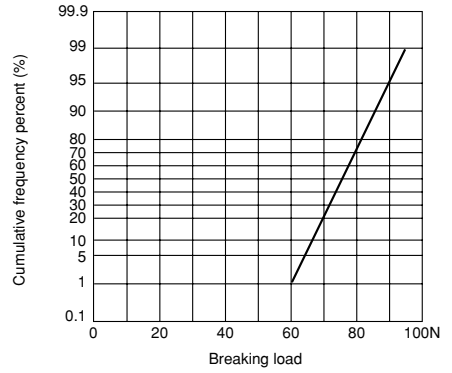
3

■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



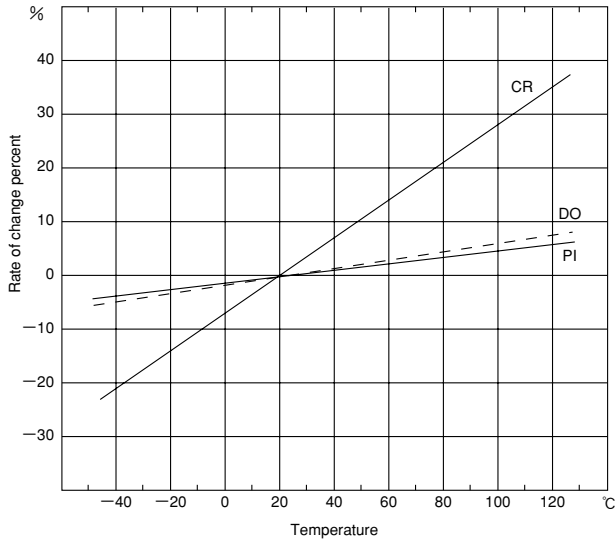
(2) Lead tensile strength



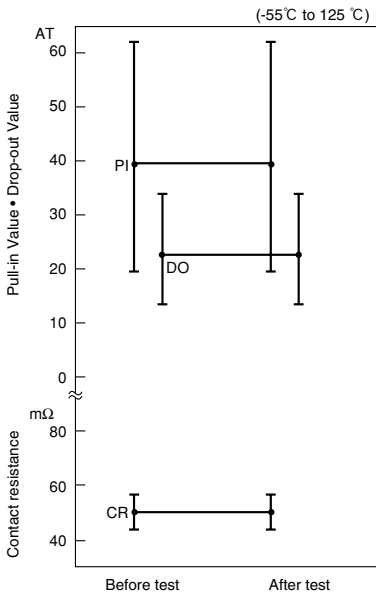
3

■ ENVIRONMENTAL CHARACTERISTICS

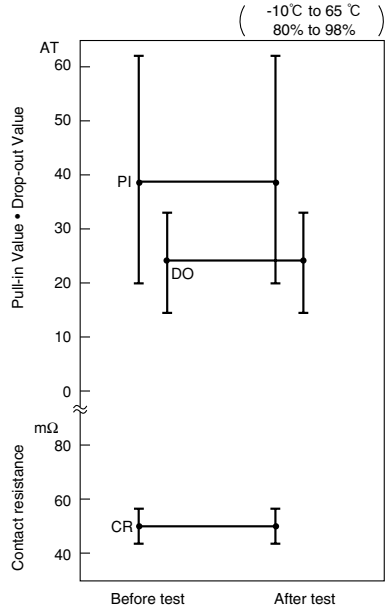
(1) Temperature characteristics



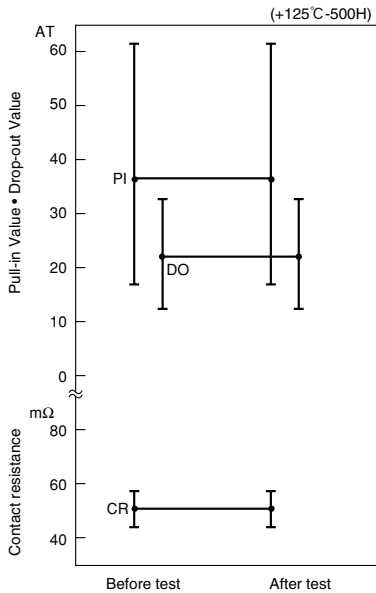
(2) Temperature cycle



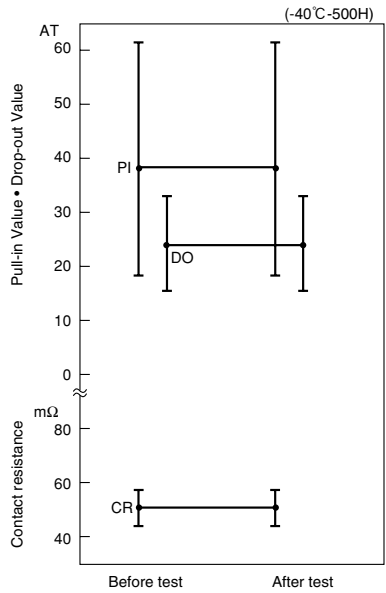
(3) Temperature and humidity cycle



(4) High temperature storage test



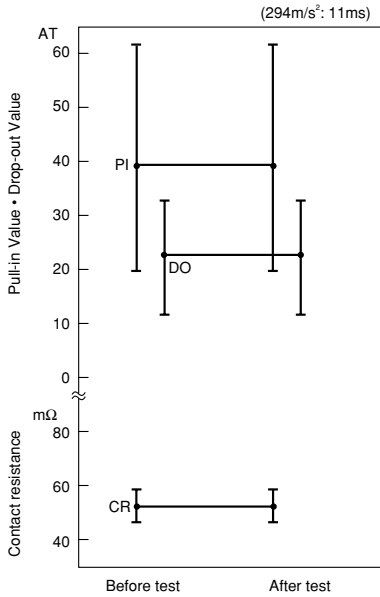
(5) Low temperature storage test



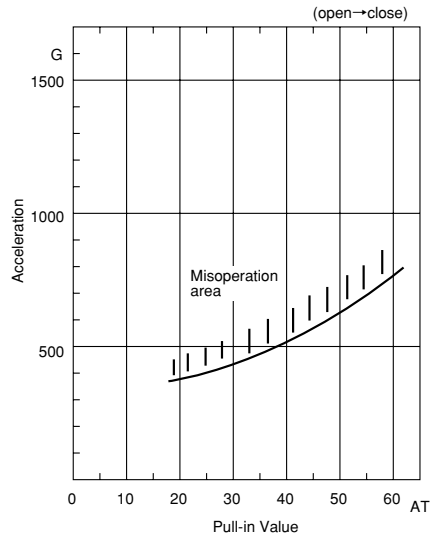
3

(6) Shock test

1) Electrical characteristics

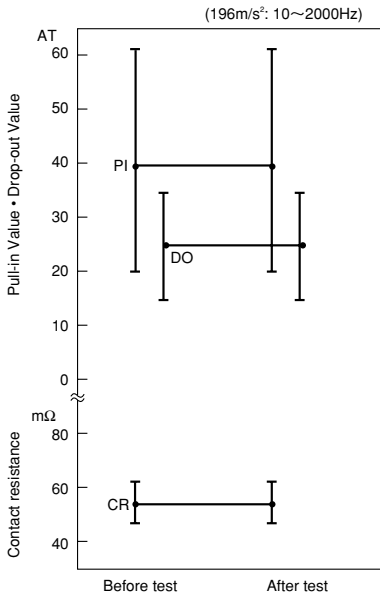


2) Misoperation area



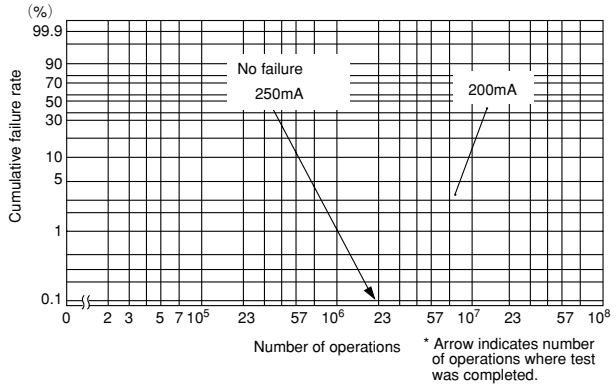
3

(7) Vibration test



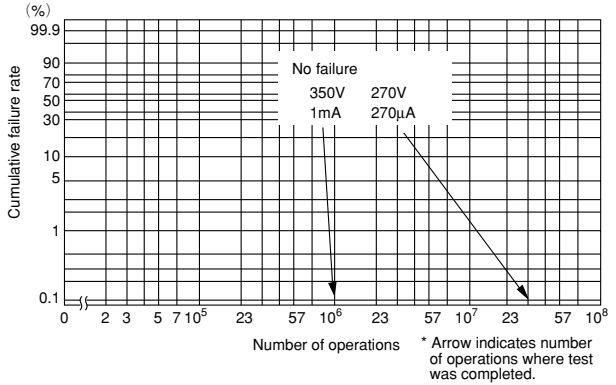
■ LIFE EXPECTANCY DATA: ORD229

Load conditions
 Voltage: 200VAC
 Current: 200mA, 250mA
 Load: Resistive load

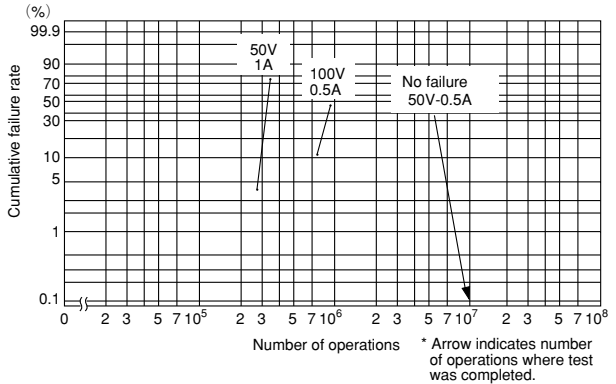


3

Load conditions
 Voltage: 350VDC, 270VDC
 Current: 1mA, 270μA
 Load: Resistive load



Load conditions
 Voltage: 100VDC, 50VDC
 Current: 0.5A, 1.0A, 0.5A
 Load: Resistive load



REED SWITCH

ORD2210

High Power

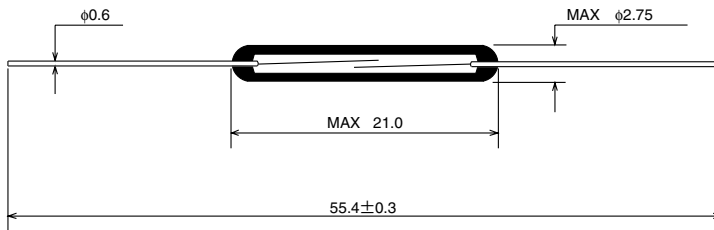
■ GENERAL DESCRIPTION

The ORD2210 is a single-contact reed switch designed for high current of 1.0 A DC and 0.7 A AC and high power of AC 70 VA and DC 50 W. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)



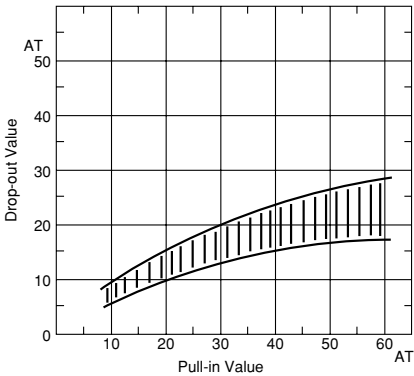
■ APPLICATIONS

- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

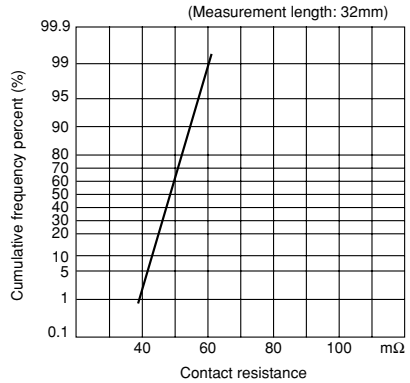
■ ELECTRICAL CHARACTERISTICS

Parameter	Rated value	Unit
Pull-in Value (PI)	15~60	AT
Drop-out Value (DO)	7min	AT
Contact resistance (CR)	100	mΩ
Breakdown voltage	250min (PI≥20)	VDC
	200min (15≤PI<20)	VDC
Insulation resistance	10 ¹⁰ min	Ω
Electrostatic capacitance	0.5max	pF
Contact rating	50	W
	70	VA
Maximum switching voltage	200DC	V
	150AC	V
Maximum switching current	1.0DC	A
	0.7AC	A
Maximum carry current	2.5	A

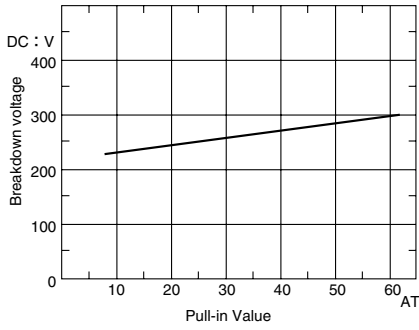
(1) Pull-in Value vs. Drop-out Value



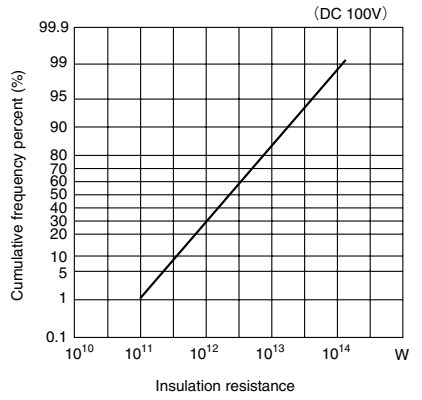
(2) Contact resistance



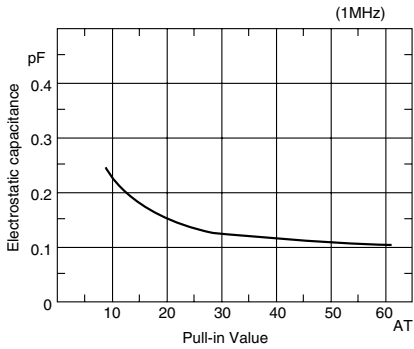
(3) Breakdown voltage



(4) Insulation resistance



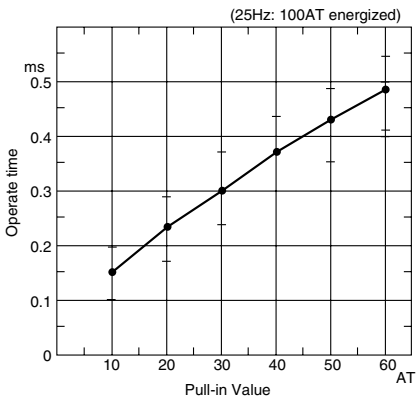
(5) Electrostatic capacitance



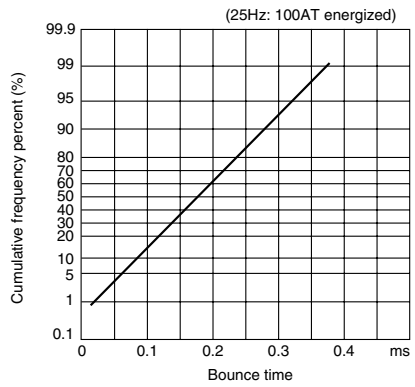
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	0.6max	ms
Bounce time	0.5max	ms
Release time	0.05max	ms
Resonant frequency	2500±250	Hz
Maximum operating frequency	500	Hz

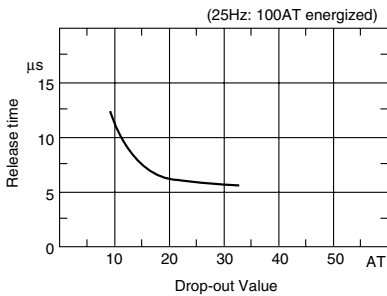
(1) Operate time



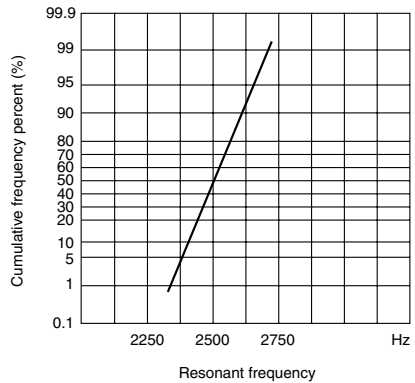
(2) Bounce time



(3) Release time



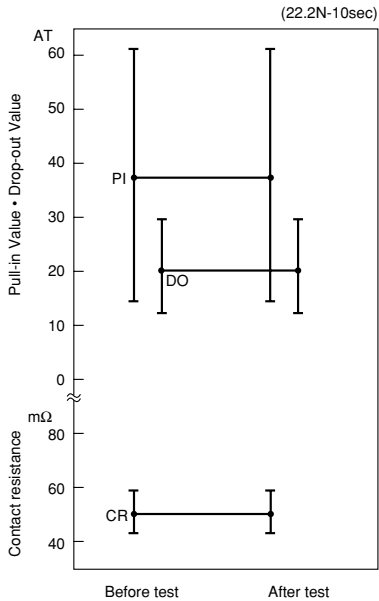
(4) Resonant frequency



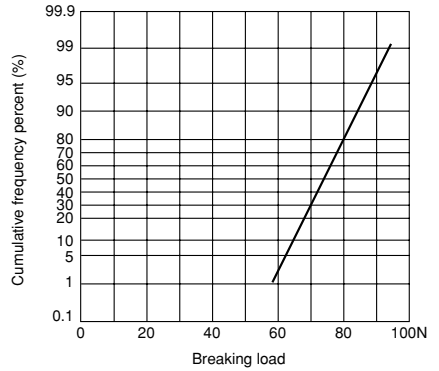
3

■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



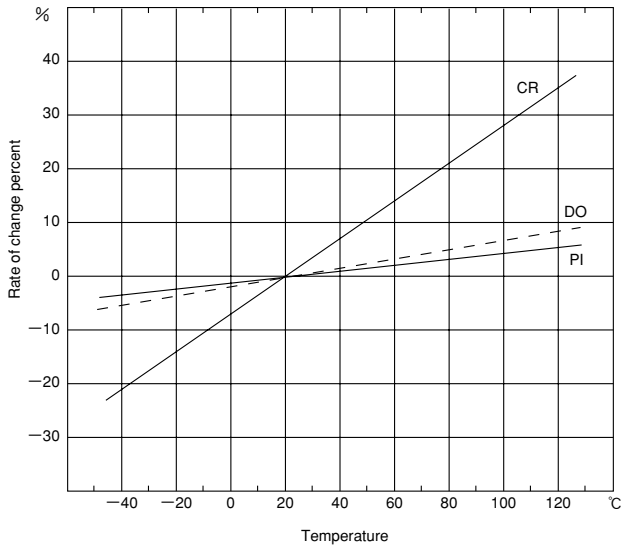
(2) Lead tensile strength



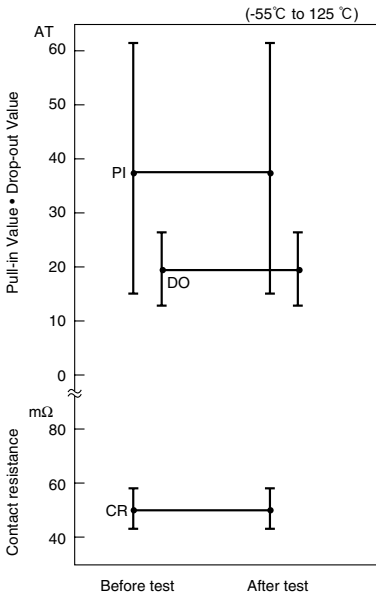
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■ ENVIRONMENTAL CHARACTERISTICS

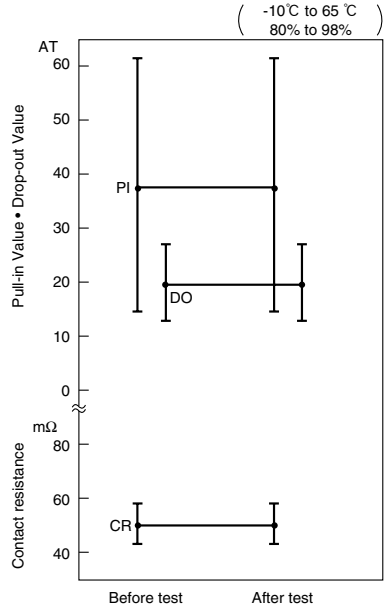
(1) Temperature characteristics



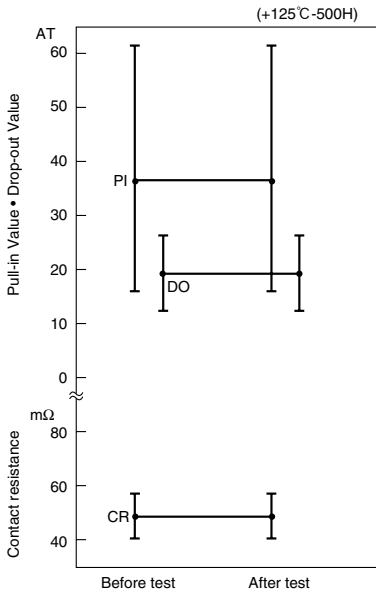
(2) Temperature cycle



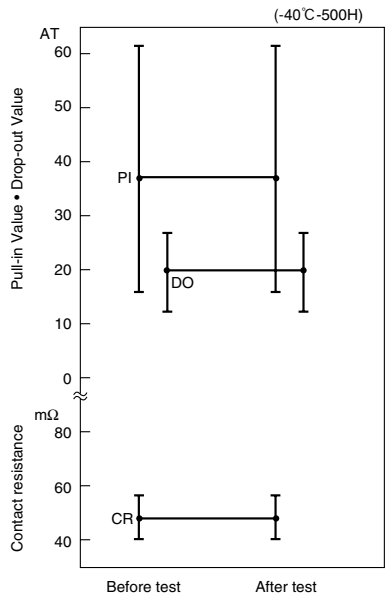
(3) Temperature and humidity cycle



(4) High temperature storage test



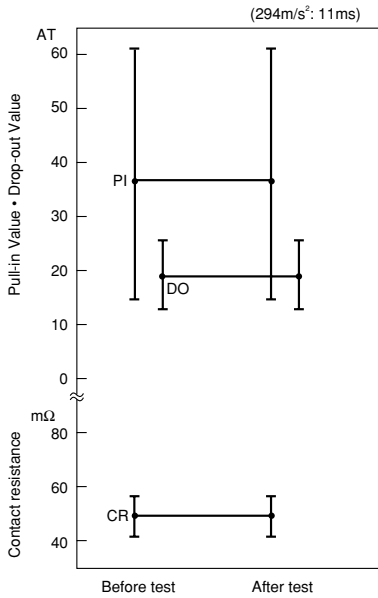
(5) Low temperature storage test



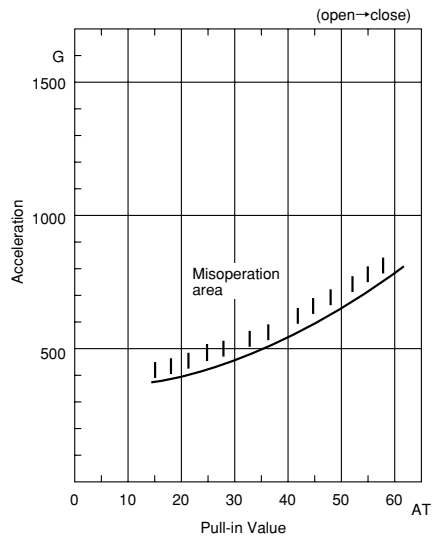
3

(6) Shock test

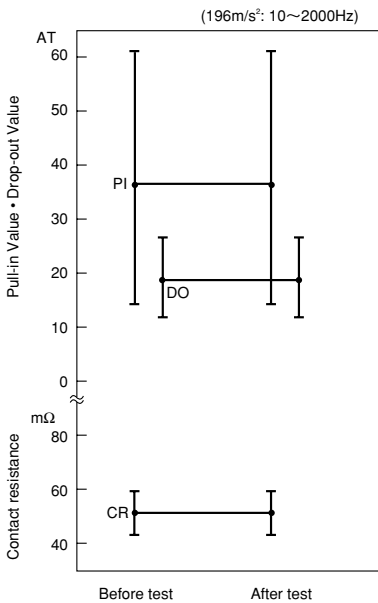
1) Electrical characteristics



2) Misoperation area

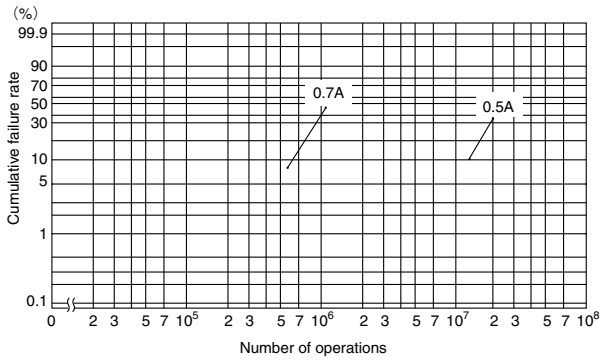


(7) Vibration test



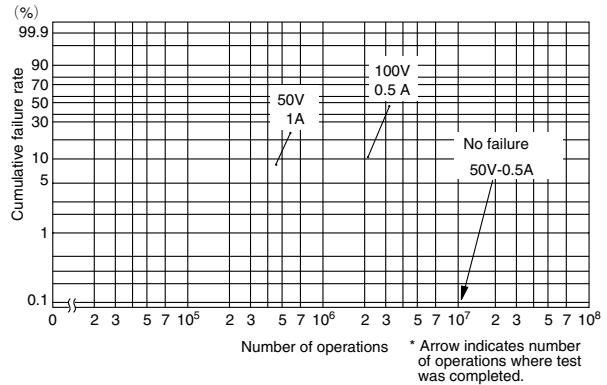
■ LIFE EXPECTANCY DATA: ORD2210

Load conditions
 Voltage: 100VAC
 Current: 0.7A, 0.5A
 Load: Resistive load

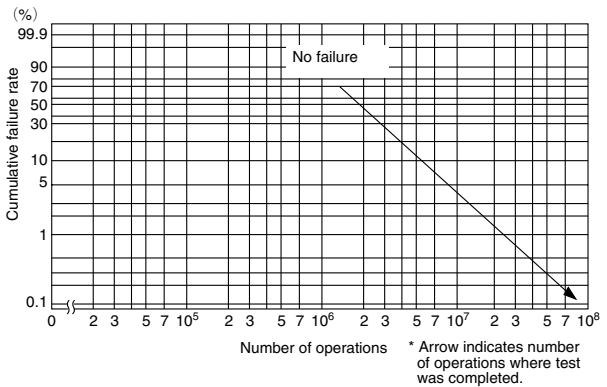


3

Load conditions
 Voltage: 100VDC, 50VDC
 Current: 0.5A, 1.0A, 0.5A
 Load: Resistive load



Load conditions
 Voltage: 15VDC
 Current: 3mA
 Load: Resistive load



REED SWITCH

ORD2210V

Vacuum High Power

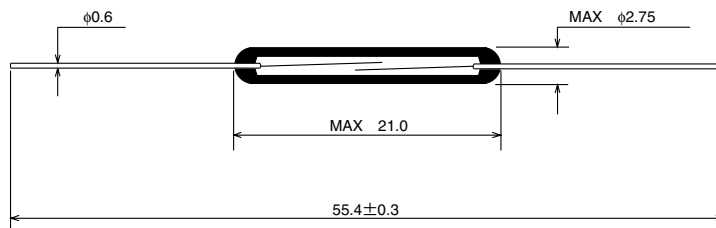
■ GENERAL DESCRIPTION

The ORD2210V is a small single-contact reed switch of a vacuum type designed for ultra high breakdown voltages 1000 V DC between the reed contacts.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

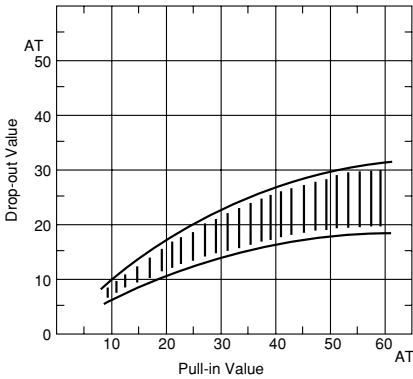
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

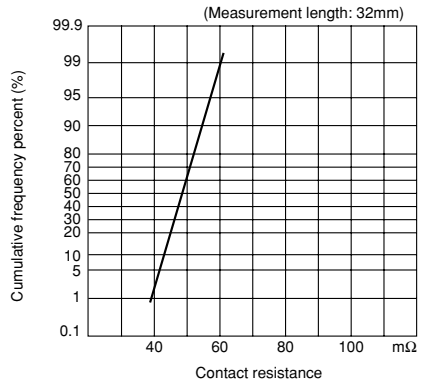
Parameter	Rated value	Unit
Pull-in Value (PI)	20~60	AT
Drop-out Value (DO)	7min	AT
Contact resistance (CR)	100	mΩ
Breakdown voltage	1000min	VDC
Insulation resistance	10 ¹⁰ min	Ω
Electrostatic capacitance	0.5max	pF
	100	VA
Maximum switching voltage	350DC	V
	300AC	V
Maximum switching current	1.0	A
Maximum carry current	2.5	A

3

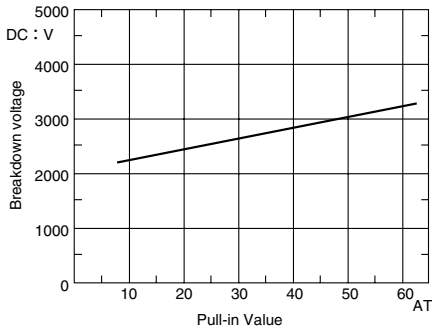
(1) Pull-in Value vs. Drop-out Value



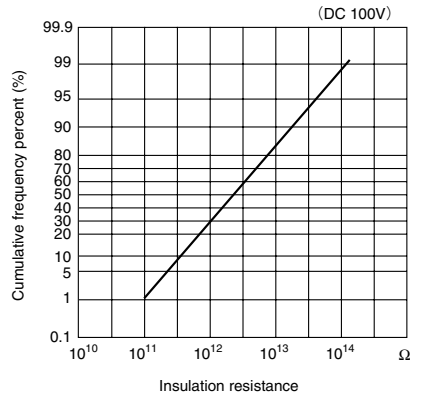
(2) Contact resistance



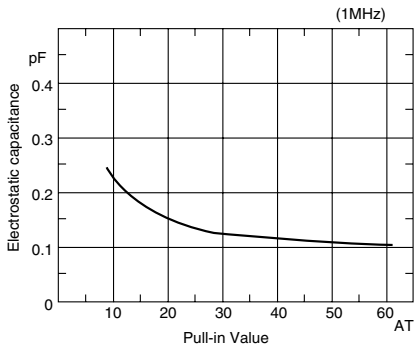
(3) Breakdown voltage



(4) Insulation resistance



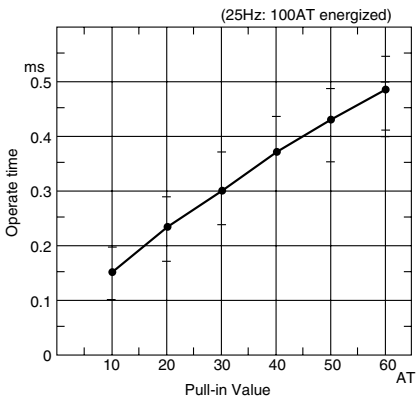
(5) Electrostatic capacitance



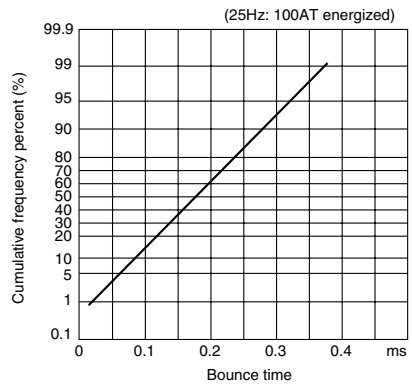
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	0.6max	ms
Bounce time	0.5max	ms
Release time	0.05max	ms
Resonant frequency	2500±250	Hz
Maximum operating frequency	500	Hz

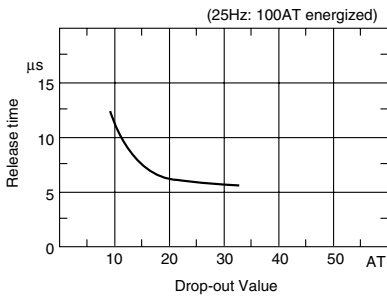
(1) Operate time



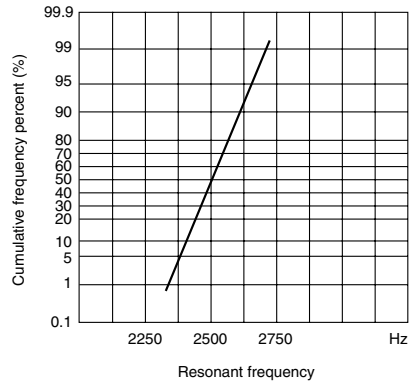
(2) Bounce time



(3) Release time



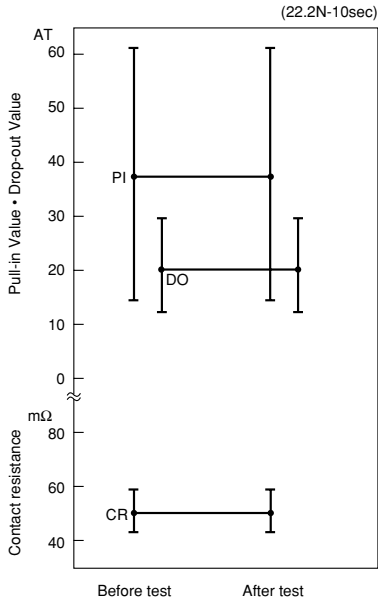
(4) Resonant frequency



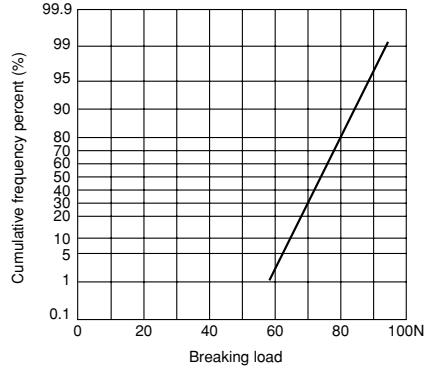
3

■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



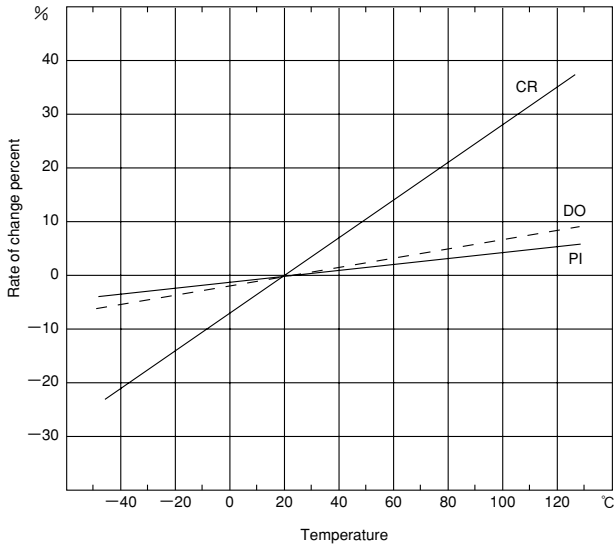
(2) Lead tensile strength



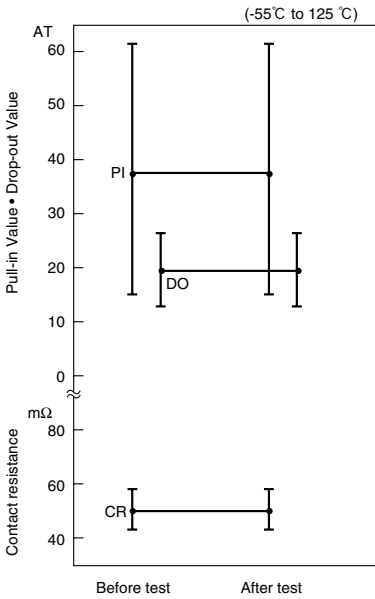
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■ ENVIRONMENTAL CHARACTERISTICS

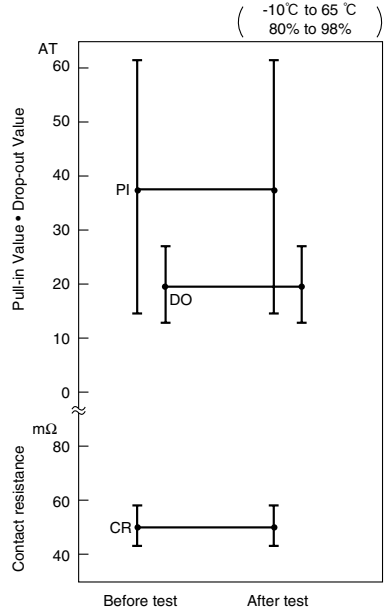
(1) Temperature characteristics



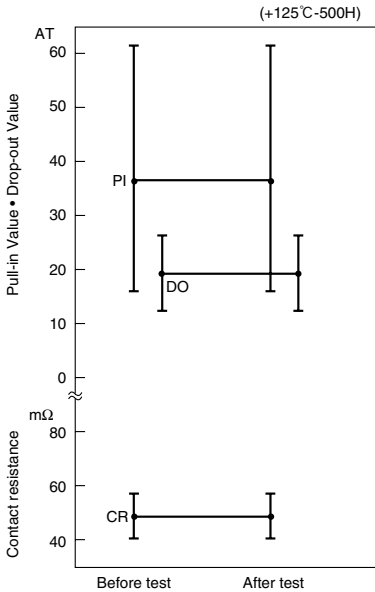
(2) Temperature cycle



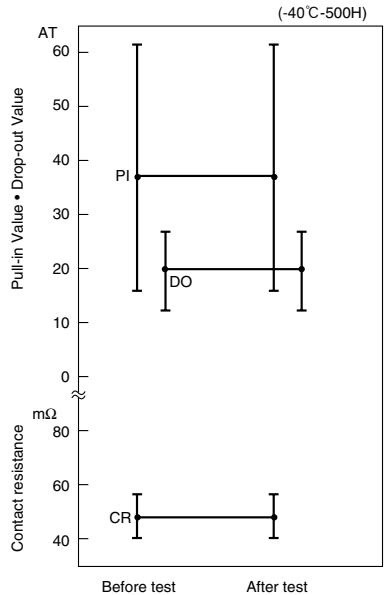
(3) Temperature and humidity cycle



(4) High temperature storage test



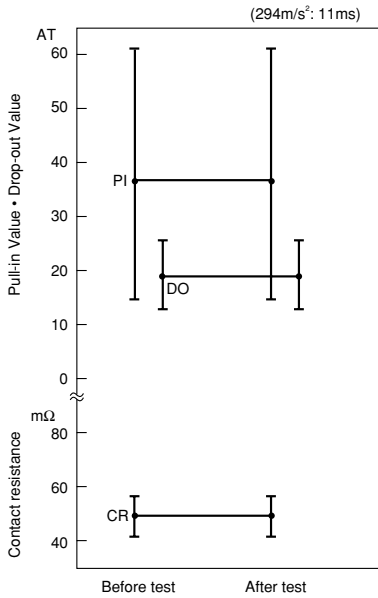
(5) Low temperature storage test



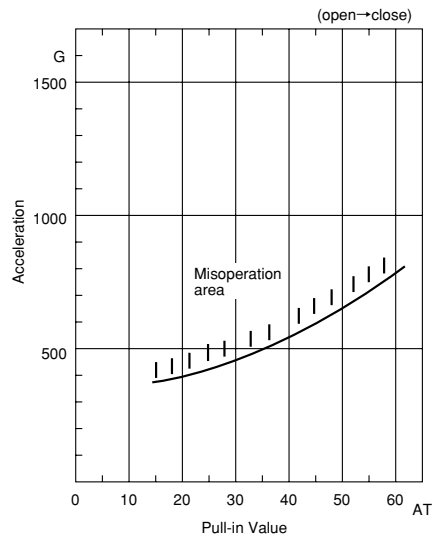
3

(6) Shock test

1) Electrical characteristics

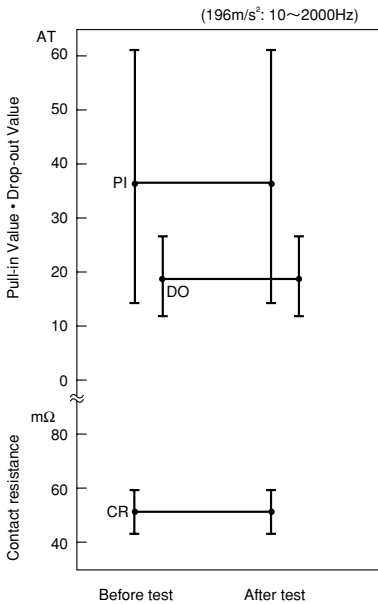


2) Misoperation area



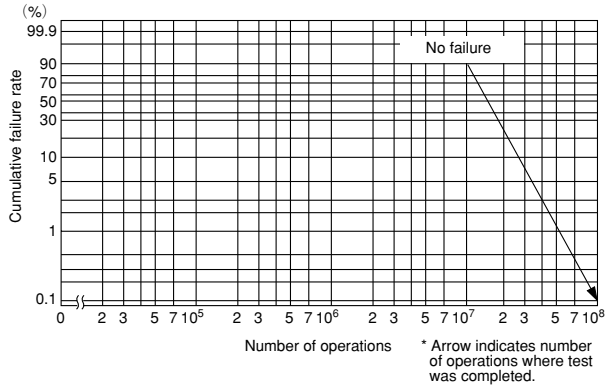
3

(7) Vibration test



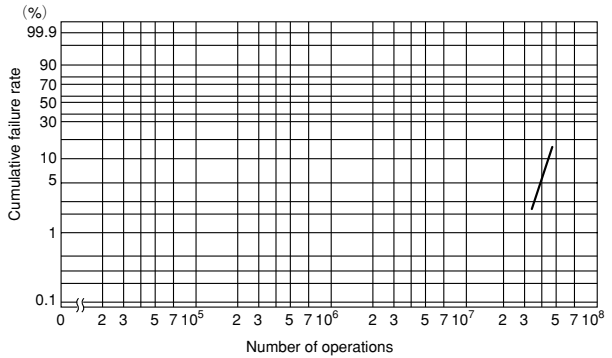
■ LIFE EXPECTANCY DATA: ORD2210V

Load conditions
 Voltage: 200VDC
 Current: 1mA
 Load: Resistive load

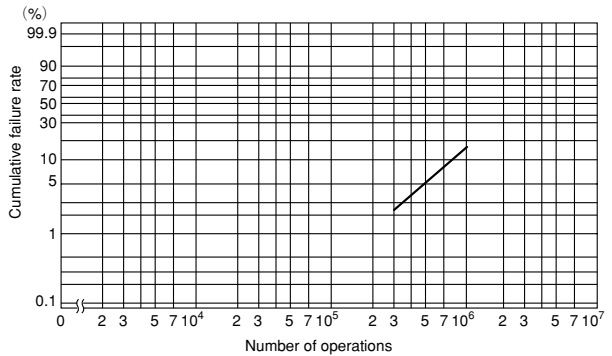


3

Load conditions
 Voltage: 500VDC
 Current: 1mA
 Load: Resistive load



Load conditions
 Voltage: 1kVDC
 Current: 1mA
 Load: Resistive load



REED SWITCH

ORD234

Long Life

■ GENERAL DESCRIPTION

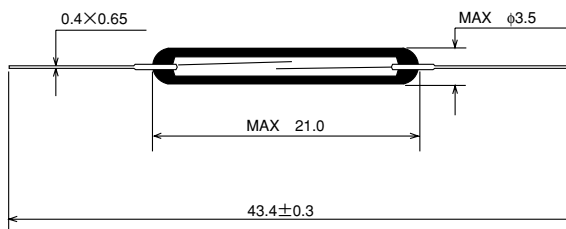
The ORD234 is a single-contact reed switch designed for long life for increased number of operations. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

3

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

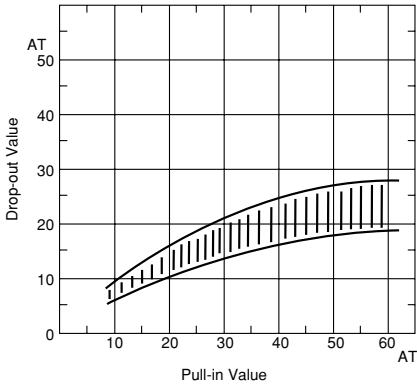
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

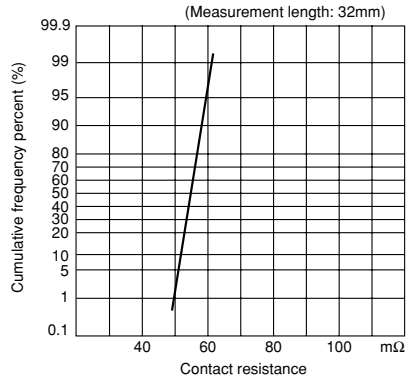
Parameter	Rated value	Unit
Pull-in Value (PI)	15~60	AT
Drop-out Value (DO)	6min	AT
Contact resistance (CR)	100max	mΩ
Breakdown voltage	250min (PI≥20)	VDC
	200min (15≤PI≤20)	VDC
Insulation resistance	10 ¹⁰ min	Ω
Electrostatic capacitance	0.5max	pF
Contact rating	10	VA
Maximum switching voltage	200DC	V
	100AC	V
Maximum switching current	0.5	A
Maximum carry current	2.0	A

3

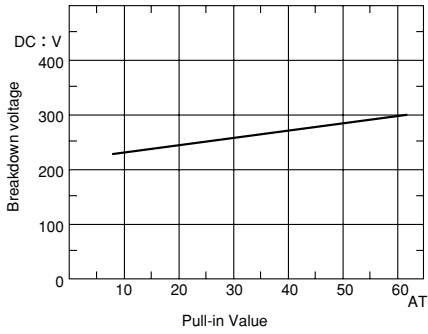
(1) Pull-in Value vs. Drop-out Value



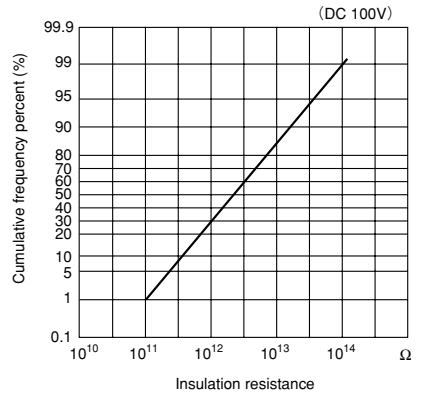
(2) Contact resistance



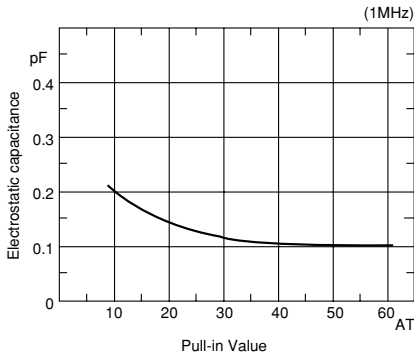
(3) Breakdown voltage



(4) Insulation resistance



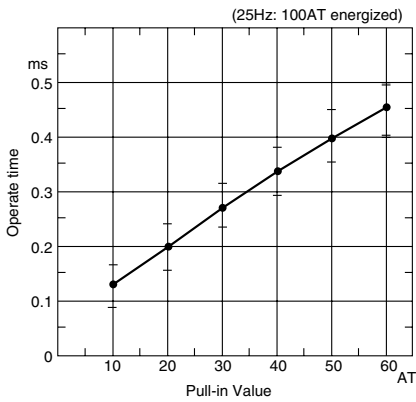
(5) Electrostatic capacitance



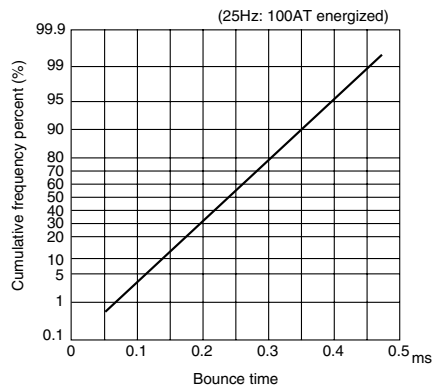
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	0.5max	ms
Bounce time	0.5max	ms
Release time	0.05max	ms
Resonant frequency	2200±300	Hz
Maximum operating frequency	500	Hz

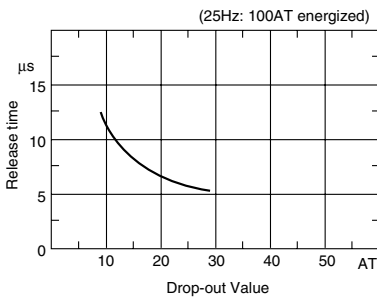
(1) Operate time



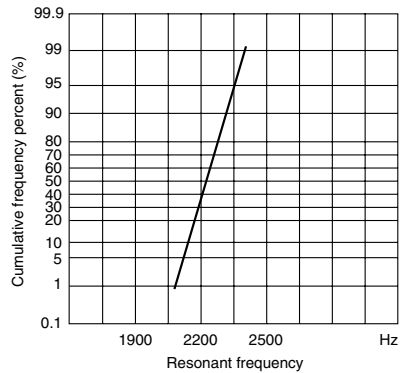
(2) Bounce time



(3) Release time



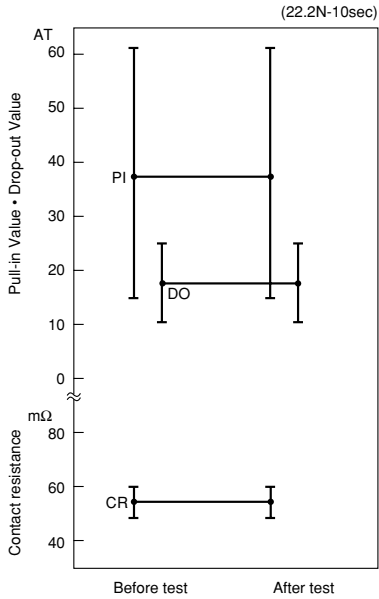
(4) Resonant frequency



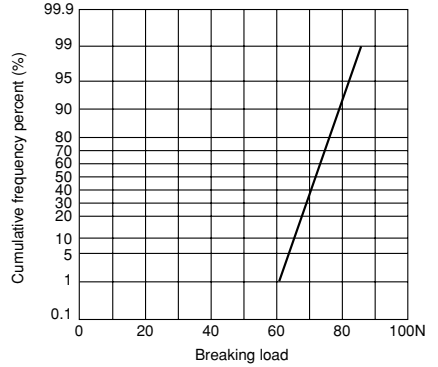
3

■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



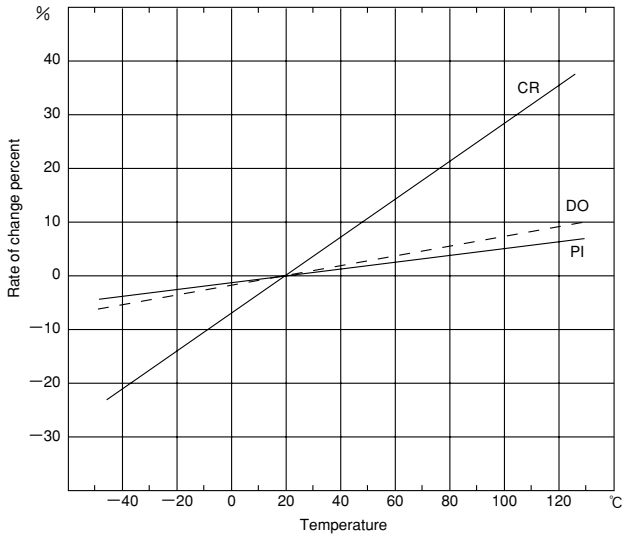
(2) Lead tensile strength



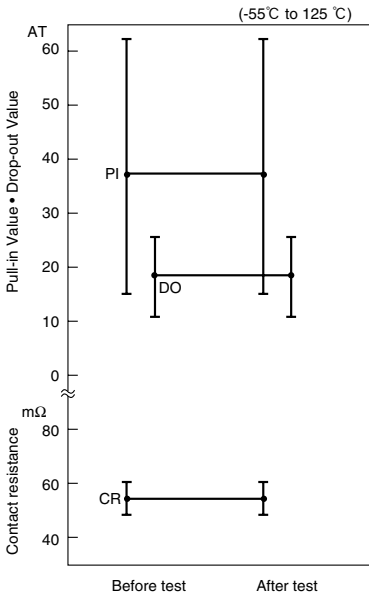
3

■ ENVIRONMENTAL CHARACTERISTICS

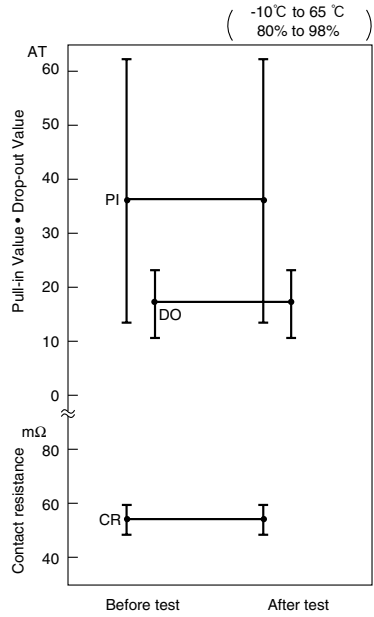
(1) Temperature characteristics



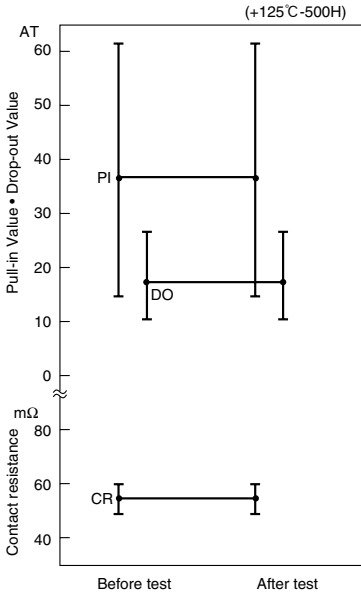
(2) Temperature cycle



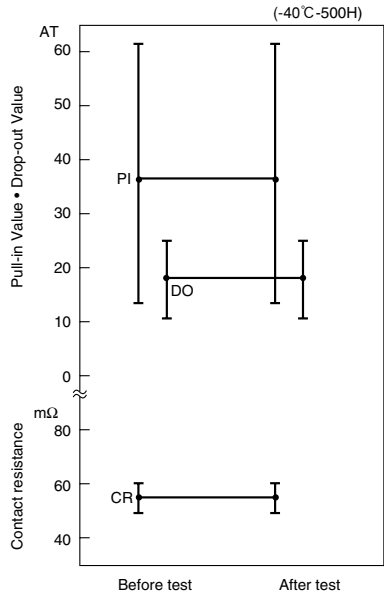
(3) Temperature and humidity cycle



(4) High temperature storage test



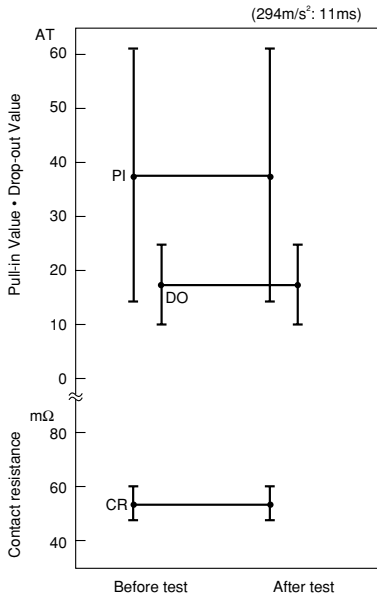
(5) Low temperature storage test



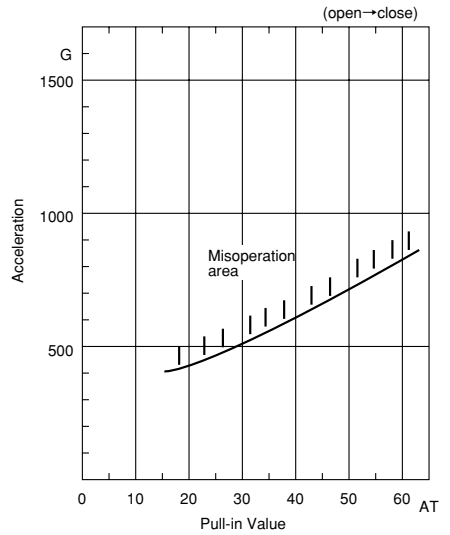
3

(6) Shock test

1) Electrical characteristics

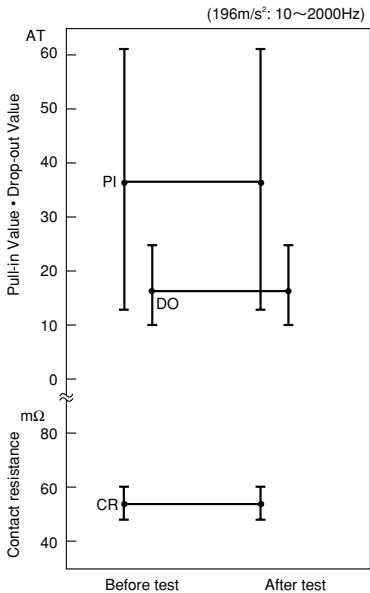


2) Misoperation area



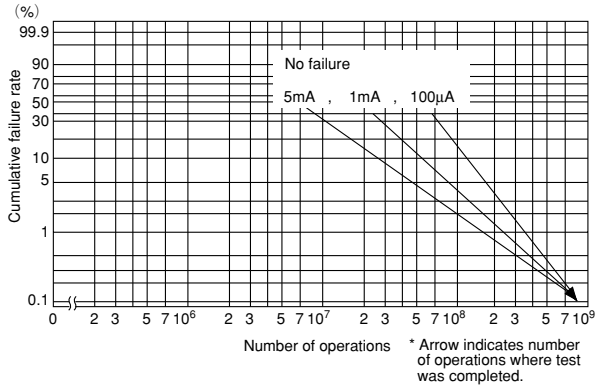
3

(7) Vibration test



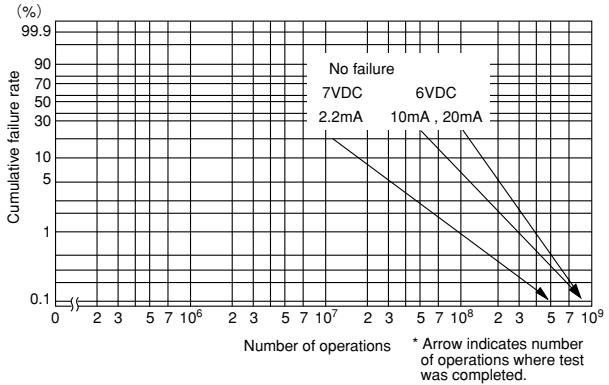
■ LIFE EXPECTANCY DATA: ORD234

Load conditions
 Voltage: 5VDC
 Current: 100µA, 1mA, 5mA
 Load: Resistive load

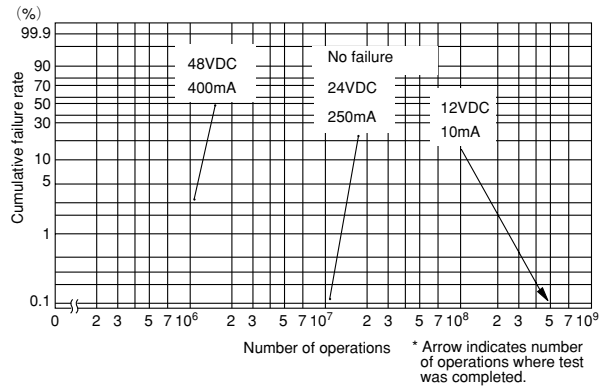


3

Load conditions
 Voltage: 6VDC, 7VDC
 Current: 10mA, 20mA, 2.2mA
 Load: Resistive load



Load conditions
 Voltage: 12VDC, 24VDC, 48VDC
 Current: 10mA, 250mA, 400mA
 Load: Resistive load



REED SWITCH

ORT551

Ultraminiature change over

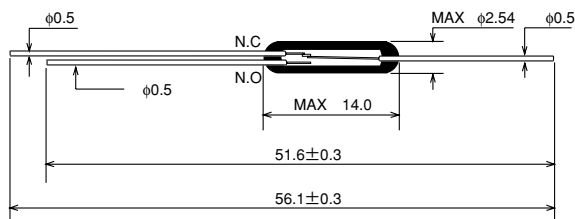
■ GENERAL DESCRIPTION

The ORT551 is a ultraminiature two-contacts reed switch designed for changeover type operation. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

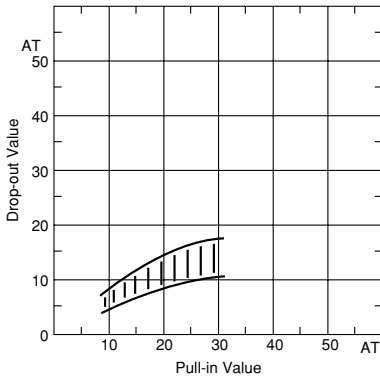
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

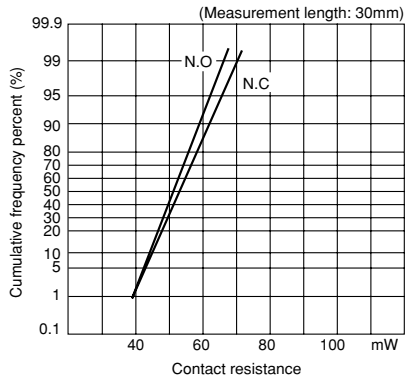
Parameter	Rated value	Unit
Pull-in Value (PI)	10~30	AT
Drop-out Value (DO)	4min	AT
Contact resistance (CR)	100max	mW
Breakdown voltage	200min ($PI \geq 20$)	VDC
	150min ($10 \leq PI < 20$)	VDC
Insulation resistance	10^9 min	W
Electrostatic capacitance	1.5max	pF
Contact rating	3	VA
Maximum switching voltage	30 ($\frac{DC}{AC}$)	V
Maximum switching current	0.2	A
Maximum carry current	0.5	A

3

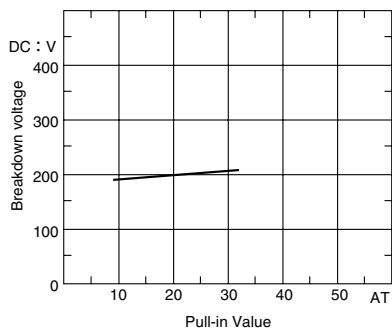
(1) Pull-in Value vs. Drop-out Value



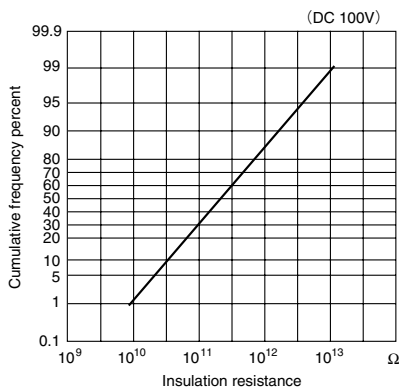
(2) Contact resistance



(3) Breakdown voltage

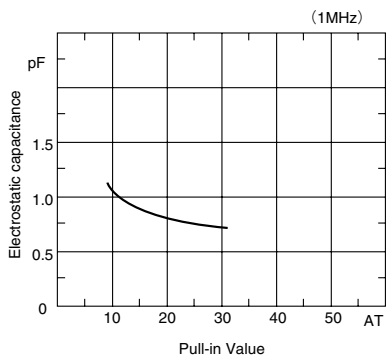


(4) Insulation resistance



3

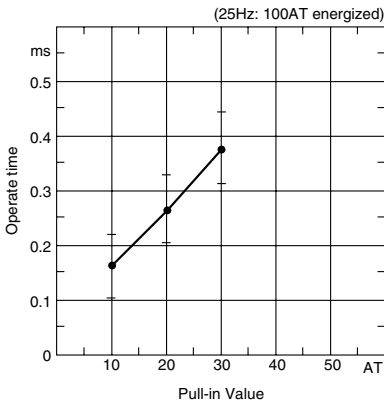
(5) Electrostatic capacitance



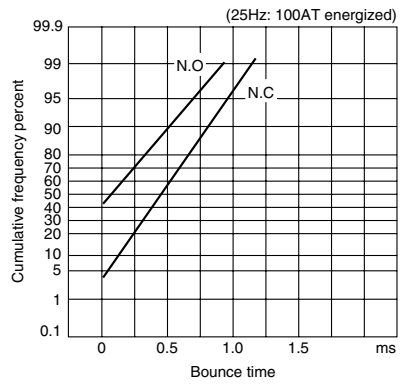
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	1.0max	ms
Bounce time	NO 1.0max	ms
	NC 1.5max	ms
Release time	0.5max	ms
Resonant frequency	6000±4000	Hz
Maximum operating frequency	200	Hz

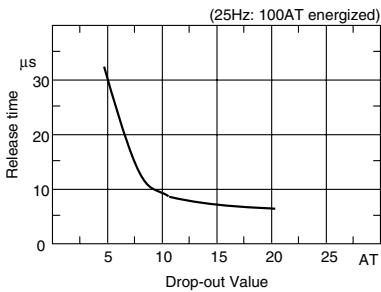
(1) Operate time



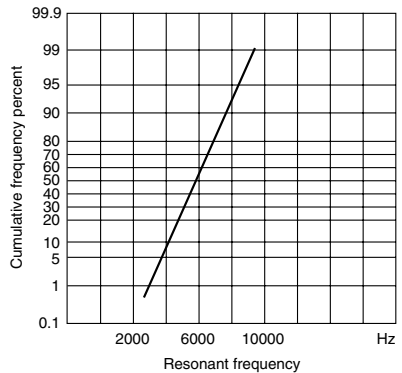
(2) Bounce time



(3) Release time



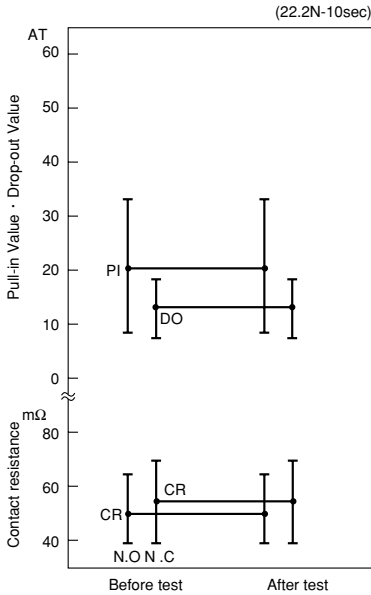
(4) Resonant frequency



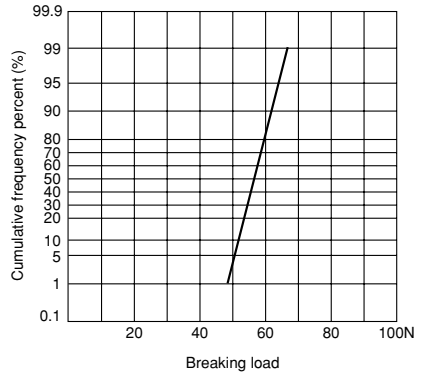
3

■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



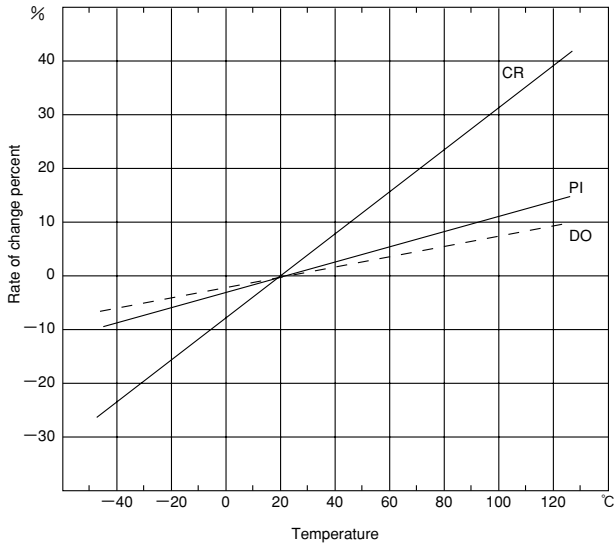
(2) Lead tensile strength



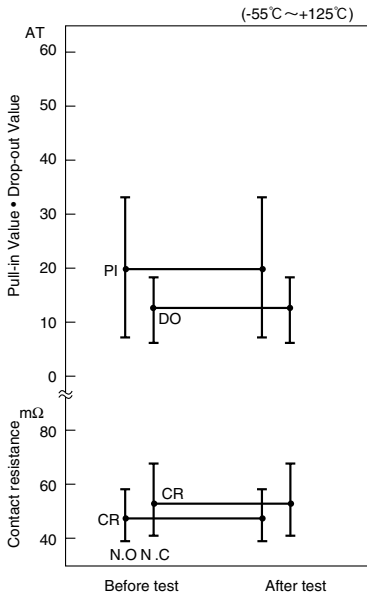
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■ ENVIRONMENTAL CHARACTERISTICS

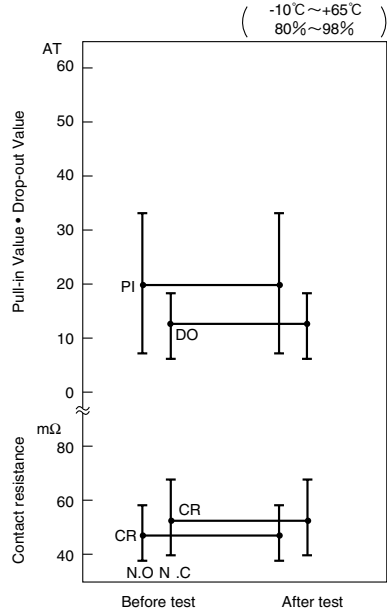
(1) Temperature characteristics



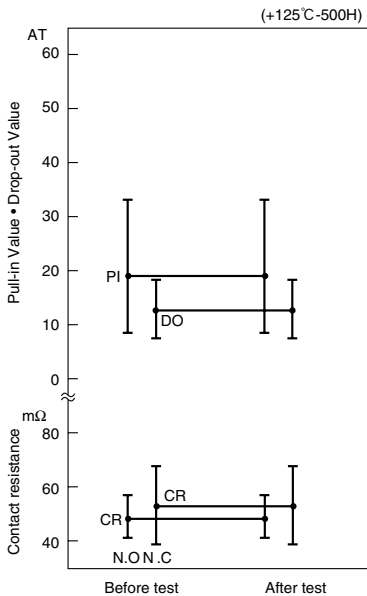
(2) Temperature cycle



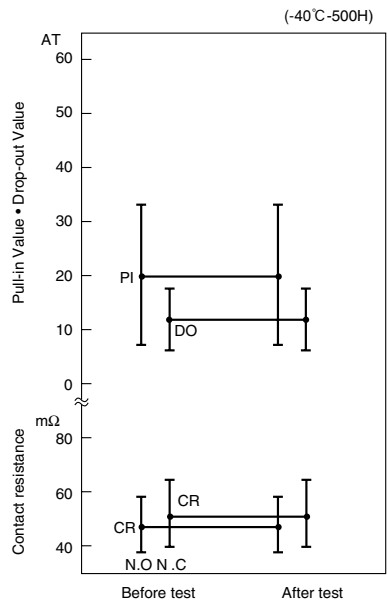
(3) Temperature and humidity cycle



(4) High temperature storage test



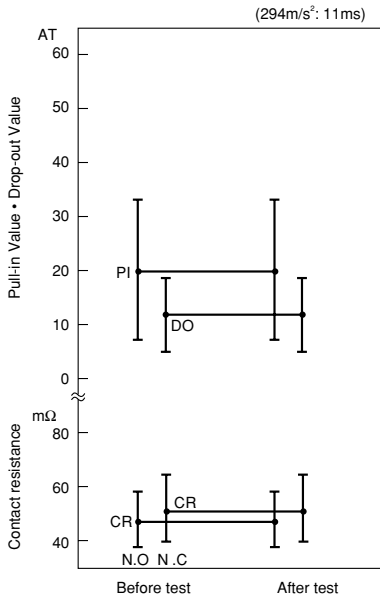
(5) Low temperature storage test



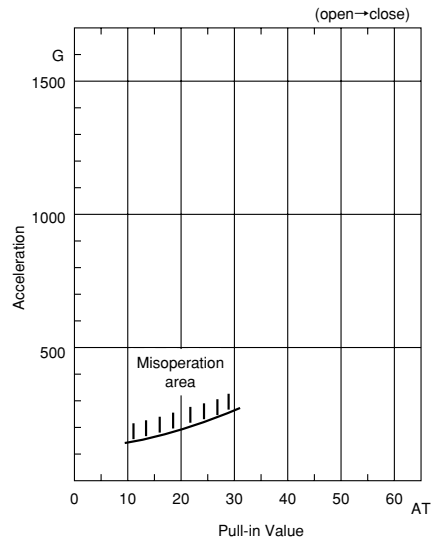
3

(6) Shock test

1) Electrical characteristics

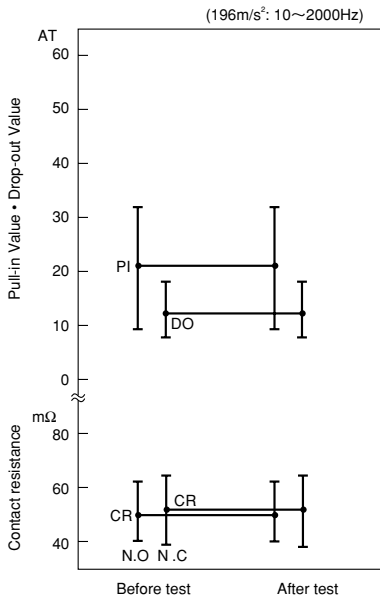


2) Misoperation area



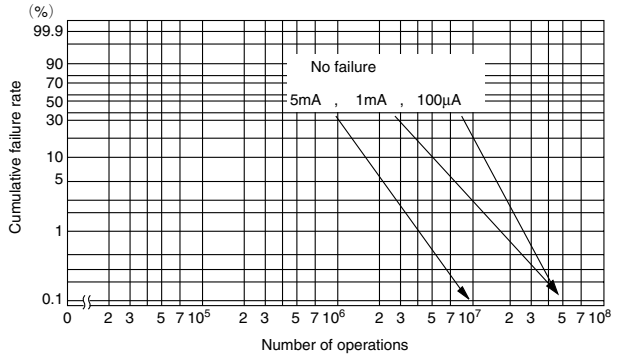
3

(7) Vibration test



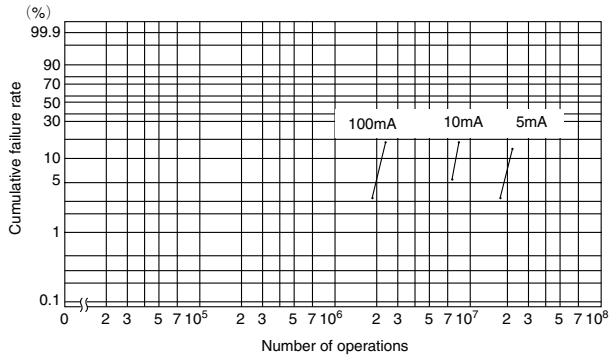
■ LIFE EXPECTANCY DATA: ORT551

Load conditions
 Voltage: 5VDC
 Current: 100μA, 1mA, 5mA
 Load: Resistive load

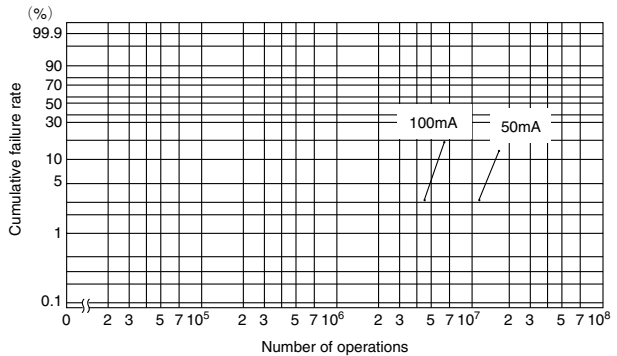


* Arrow indicates number of operations where test was completed.

Load conditions
 Voltage: 12VDC
 Current: 5mA, 10mA, 100mA
 Load: Resistive load



Load conditions
 Voltage: 24VDC
 Current: 50mA, 100mA
 Load: Resistive load



3

REED SWITCH

ORD2220

Miniature Wide Differential

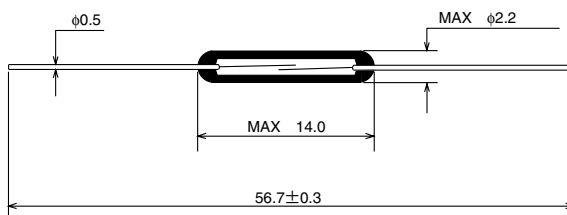
■ GENERAL DESCRIPTION

The ORD2220 is a small single-contact reed switch designed for general control of low-level loads less than 40 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

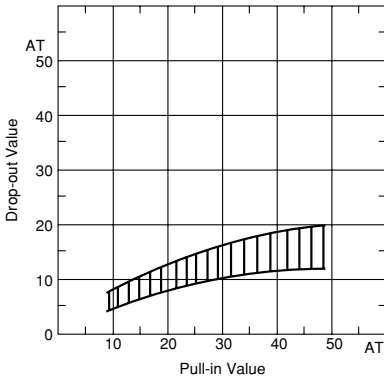
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

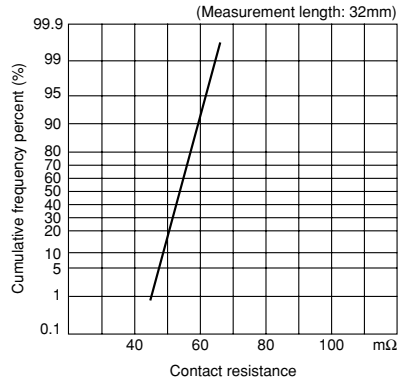
Parameter	Rated value	Unit
Pull-in Value (PI)	08~40	AT
Drop-out Value (DO)	3min	AT
Contact resistance (CR)	100max	mΩ
Breakdown voltage	200min	VDC
Insulation resistance	10 ⁹ min	Ω
Electrostatic capacitance	0.3max	pF
Contact rating	16	VA
Maximum switching voltage	40 $\frac{DC}{AC}$	V
Maximum switching current	0.4	A
Maximum carry current	0.7	A

3

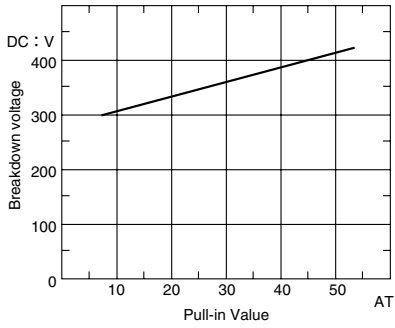
(1) Pull-in Value vs. Drop-out Value



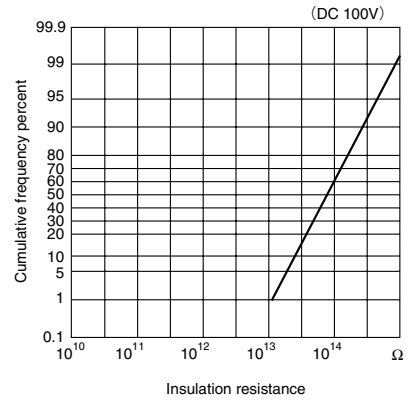
(2) Contact resistance



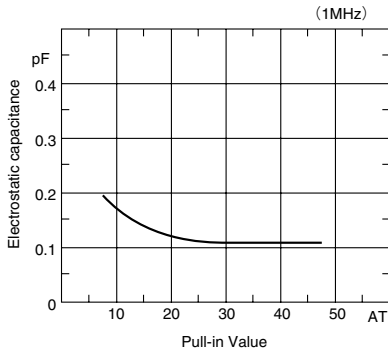
(3) Breakdown voltage



(4) Insulation resistance



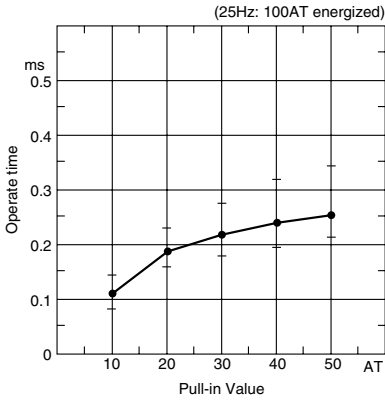
(5) Electrostatic capacitance



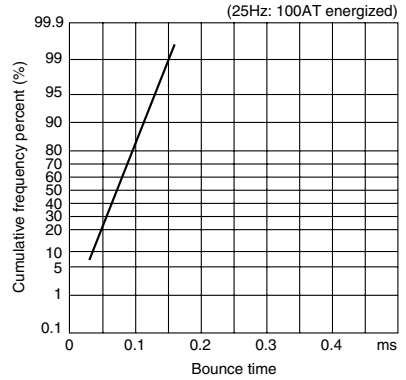
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	0.4max	ms
Bounce time	0.3max	ms
Release time	0.05max	ms
Resonant frequency	4400±400	Hz
Maximum operating frequency	500	Hz

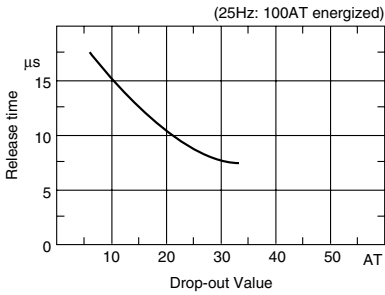
(1) Operate time



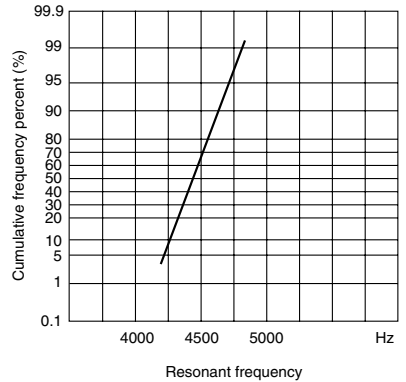
(2) Bounce time



(3) Release time



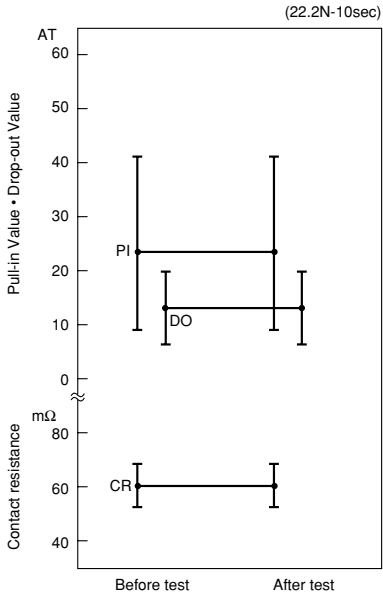
(4) Resonant frequency



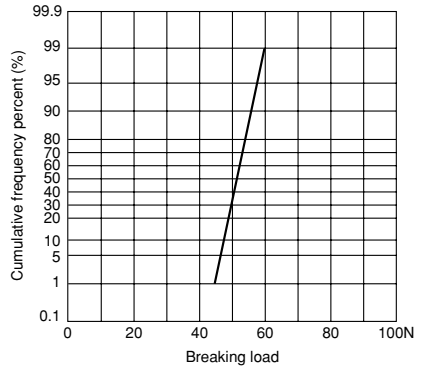
3

■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



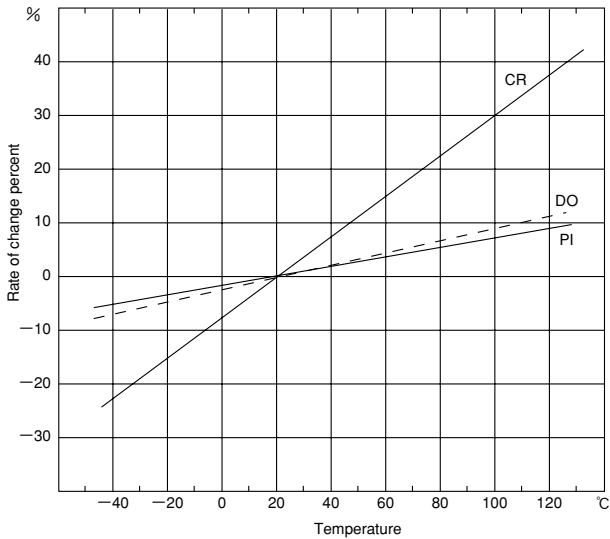
(2) Lead tensile strength



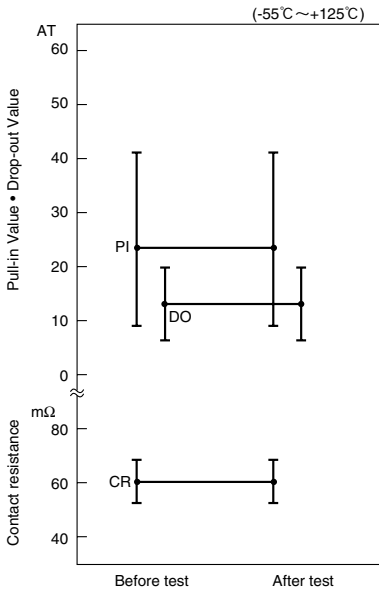
3

■ ENVIRONMENTAL CHARACTERISTICS

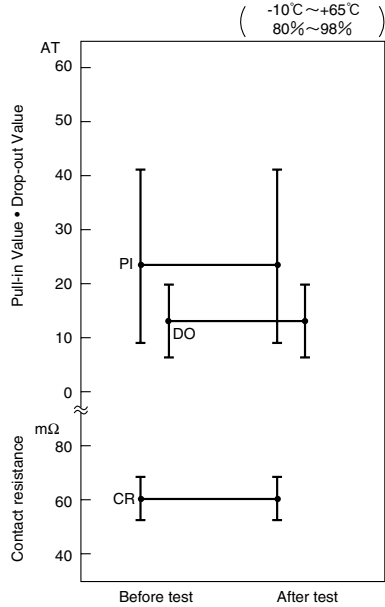
(1) Temperature characteristics



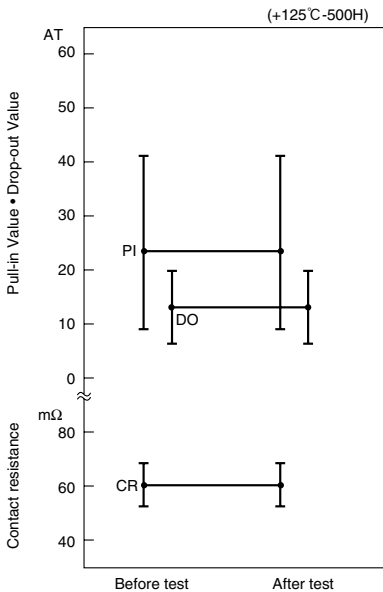
(2) Temperature cycle



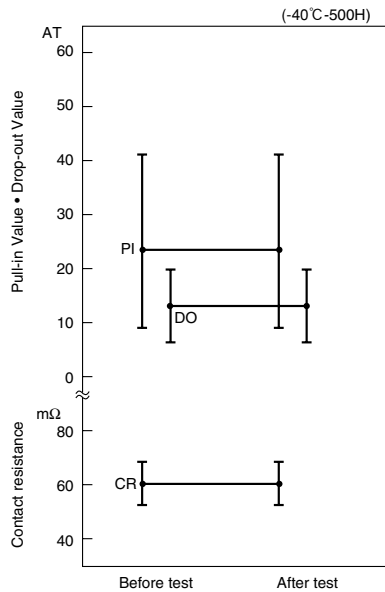
(3) Temperature and humidity cycle



(4) High temperature storage test



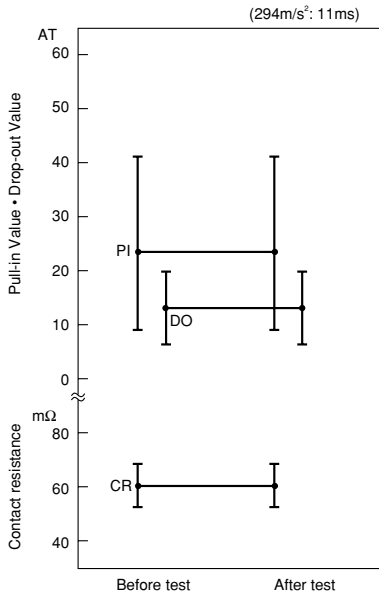
(5) Low temperature storage test



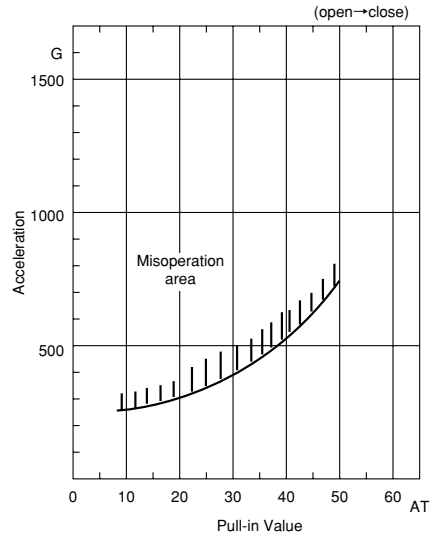
3

(6) Shock test

1) Electrical characteristics

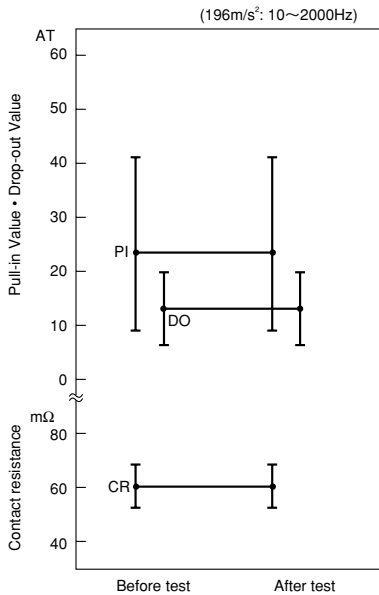


2) Misoperation area



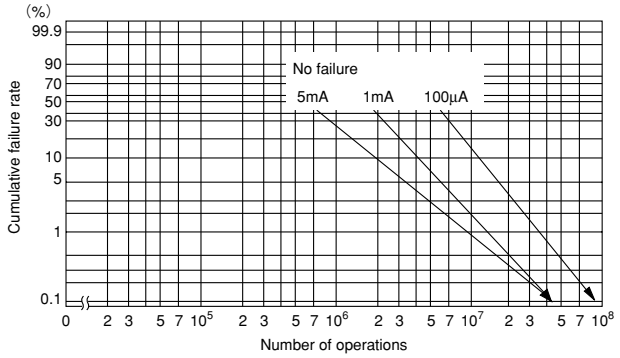
3

(7) Vibration test



■ LIFE EXPECTANCY DATA: ORD2220

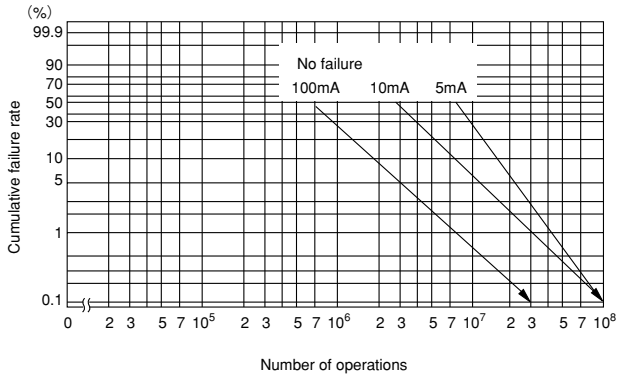
Load conditions
 Voltage: 5VDC
 Current: 100µA, 1mA, 5mA
 Load: Resistive load



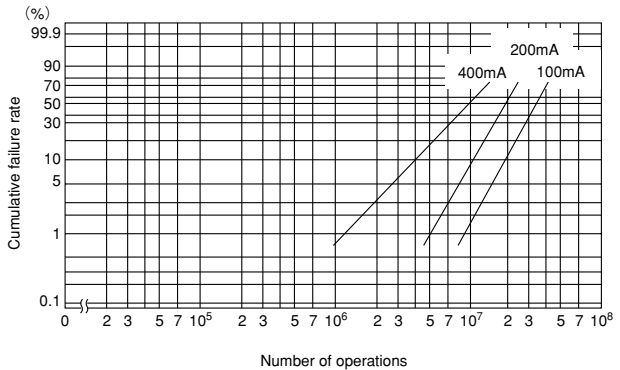
* Arrow indicates number of operations where test was completed.

3

Load conditions
 Voltage: 12VDC
 Current: 5mA, 10mA, 100mA
 Load: Resistive load



Load conditions
 Voltage: 24VDC
 Current: 100mA, 200mA, 400mA
 Load: Resistive load



REED SWITCH

ORD2221

Miniature Offset type Long Lead

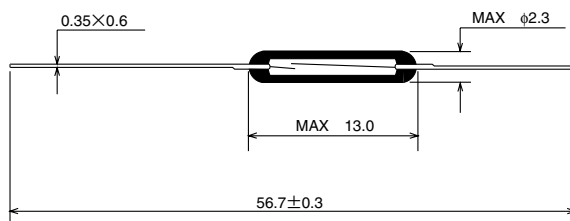
■ GENERAL DESCRIPTION

The ORD2221 is a single-contact reed switch designed for general control of medium-level loads less than 100 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

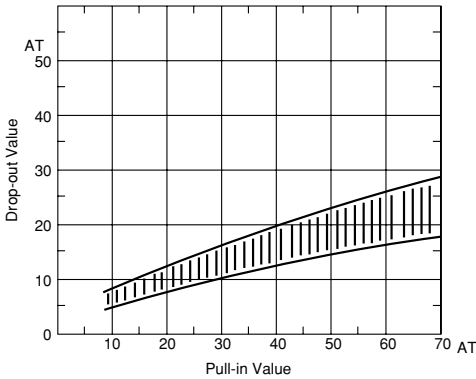
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

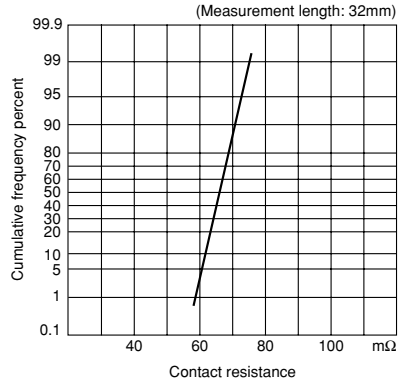
Parameter	Rated value	Unit
Pull-in Value (PI)	10~70	AT
Drop-out Value (DO)	5min	AT
Contact resistance (CR)	100max	mΩ
Breakdown voltage	200min (PI \geq 20)	VDC
	150min (10 \leq PI<20)	VDC
Insulation resistance	10 ⁹ min	Ω
Electrostatic capacitance	0.3max	pF
Contact rating	10	VA
Maximum switching voltage	100 $\left(\frac{DC}{AC}\right)$	V
Maximum switching current	0.3	A
Maximum carry current	1.0	A

3

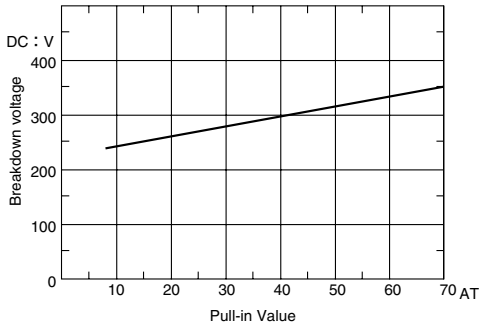
(1) Pull-in Value vs. Drop-out Value



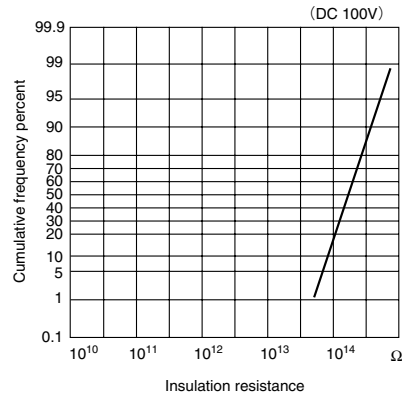
(2) Contact resistance



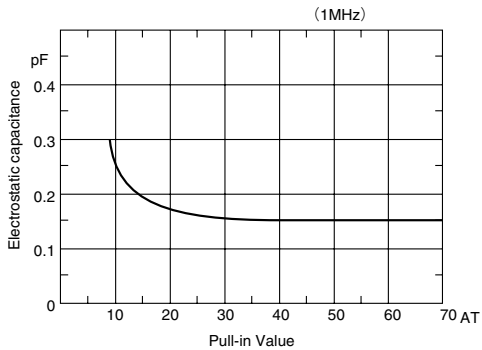
(3) Breakdown voltage



(4) Insulation resistance



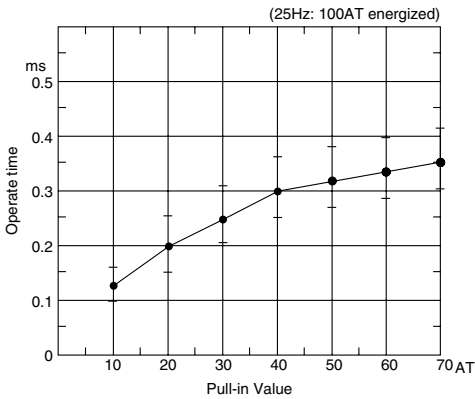
(5) Electrostatic capacitance



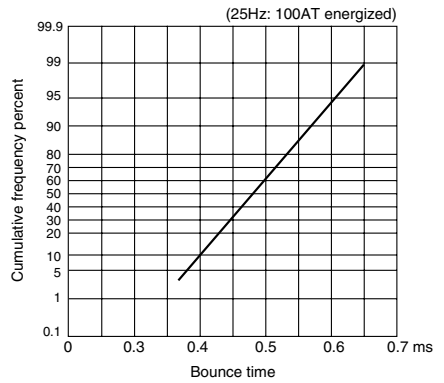
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	1.0max	ms
Bounce time	1.0max	ms
Release time	0.05max	ms
Resonant frequency	2750±250	Hz
Maximum operating frequency	500	Hz

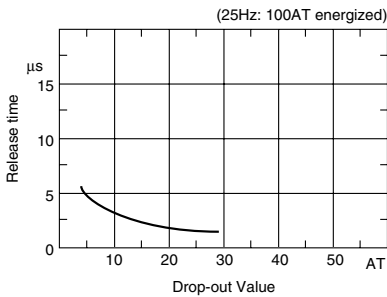
(1) Operate time



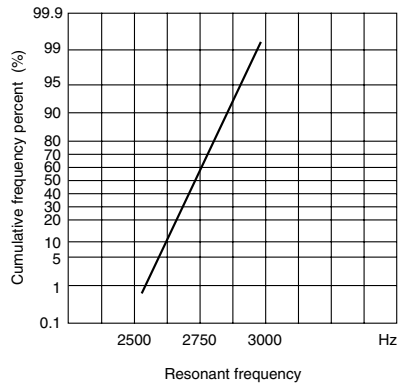
(2) Bounce time



(3) Release time



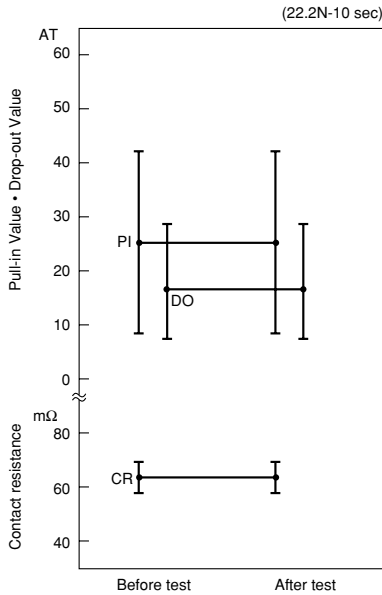
(4) Resonant frequency



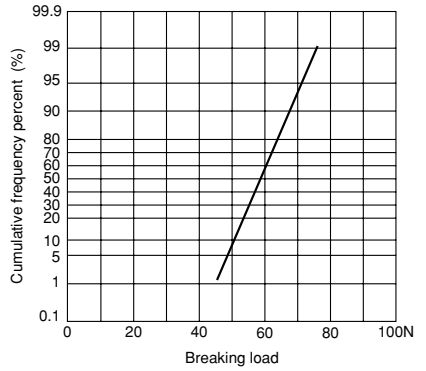
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■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



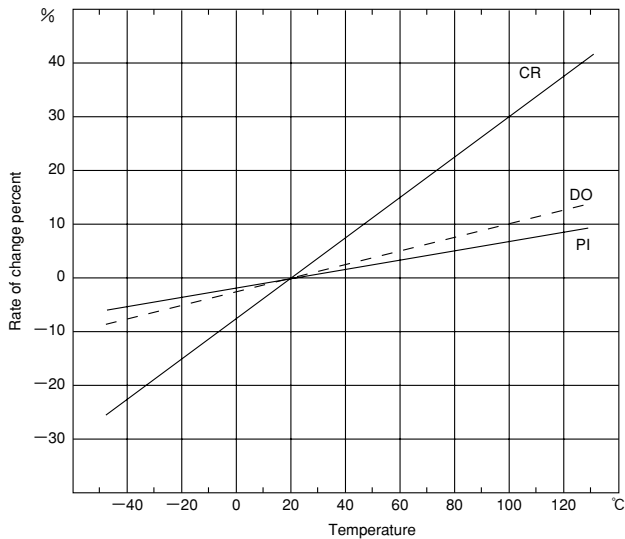
(2) Lead tensile strength



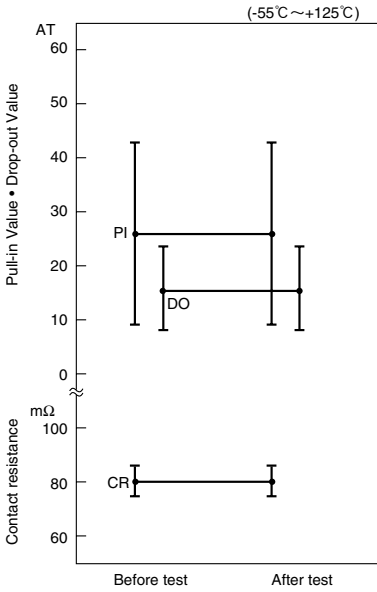
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■ ENVIRONMENTAL CHARACTERISTICS

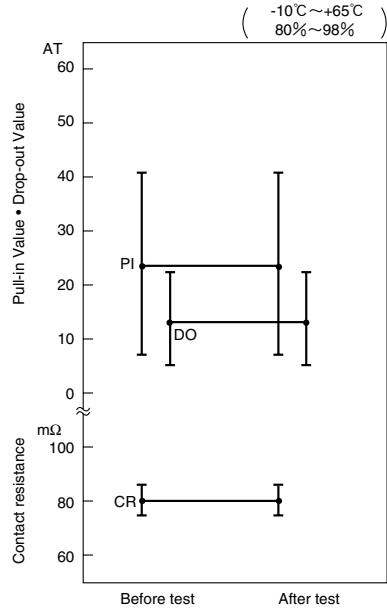
(1) Temperature characteristics



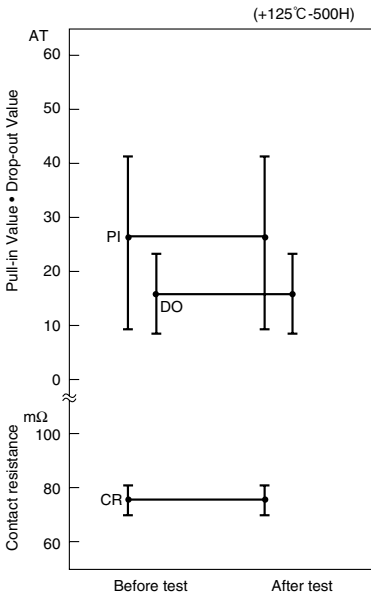
(2) Temperature cycle



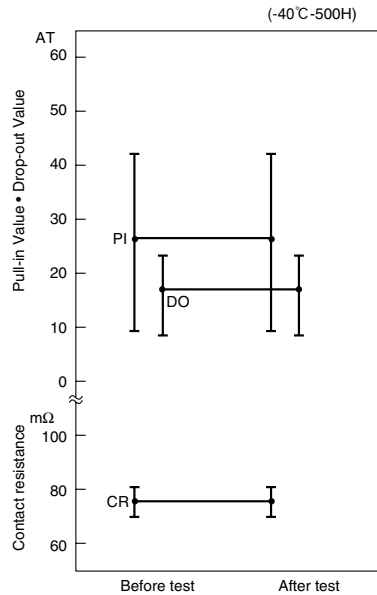
(3) Temperature and humidity cycle



(4) High temperature storage test



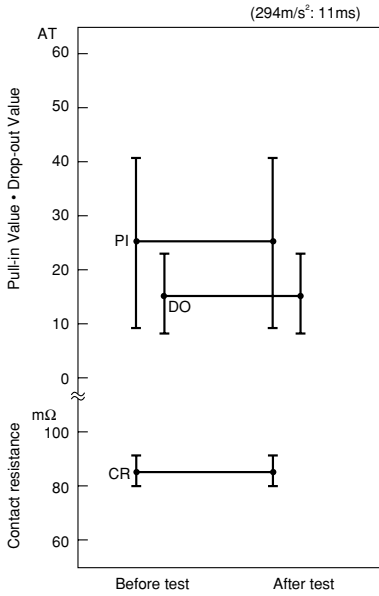
(5) Low temperature storage test



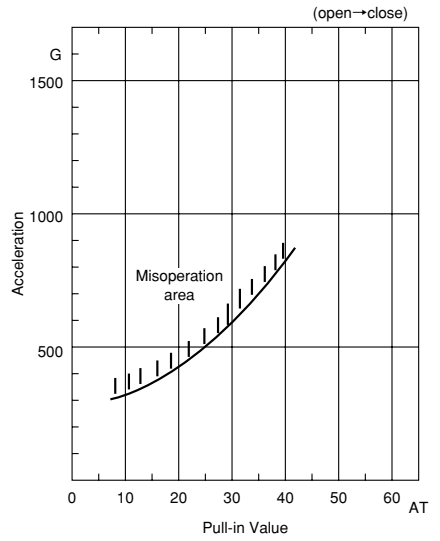
3

(6) Shock test

1) Electrical characteristics

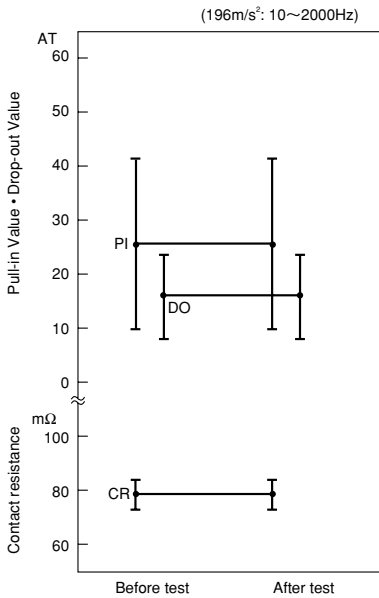


2) Misoperation area



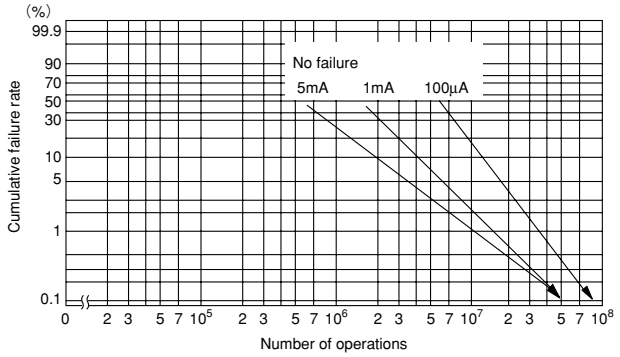
3

(7) Vibration test



■ LIFE EXPECTANCY DATA: ORD2221

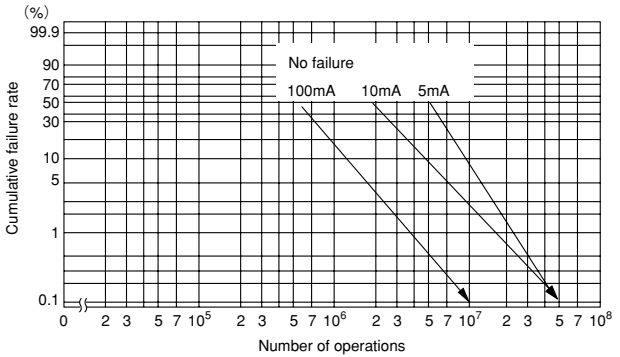
Load conditions
 Voltage: 5VDC
 Current: 100µA, 1mA, 5mA
 Load: Resistive load



* Arrow indicates number of operations where test was completed.

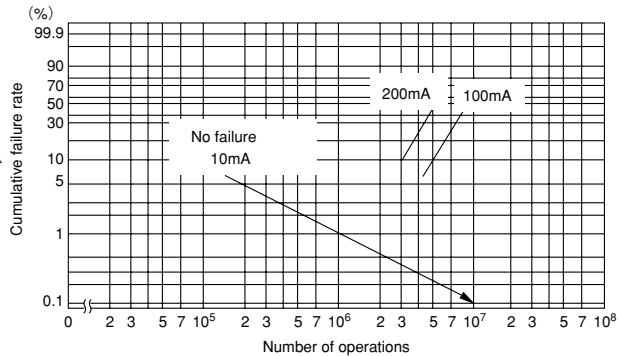
3

Load conditions
 Voltage: 12VDC
 Current: 5mA, 10mA, 100mA
 Load: Resistive load



* Arrow indicates number of operations where test was completed.

Load conditions
 Voltage: 24VDC
 Current: 10mA, 100mA, 200mA
 Load: Resistive load



* Arrow indicates number of operations where test was completed.

REED SWITCH

ORD9215

General Purpose Miniature

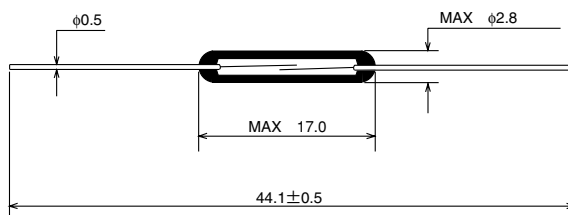
■ GENERAL DESCRIPTION

The ORD9215 is a small single-contact reed switch designed for general control of medium-level loads less than 100 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

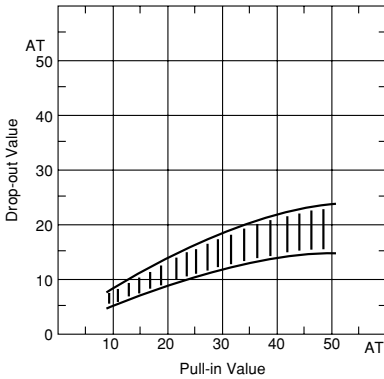
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

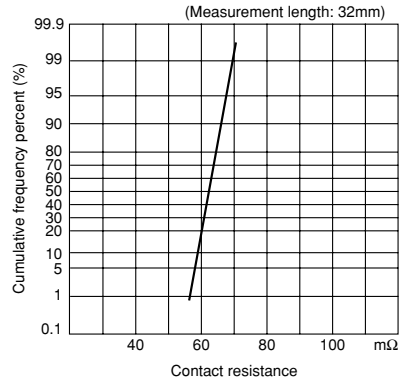
Parameter	Rated value	Unit
Pull-in Value (PI)	10~50	AT
Drop-out Value (DO)	4min	AT
Contact resistance (CR)	100max	mΩ
Breakdown voltage	150min	VDC
Insulation resistance	10 ⁹ min	Ω
Electrostatic capacitance	0.3max	pF
Contact rating	10	VA
Maximum switching voltage	100 $\frac{DC}{AC}$	V
Maximum switching current	0.4	A
Maximum carry current	1.0	A

3

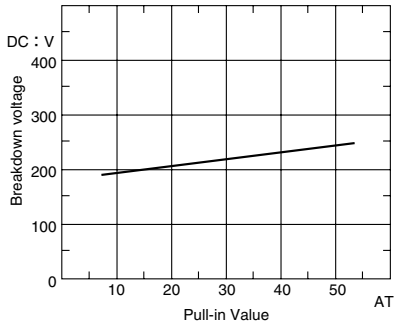
(1) Pull-in Value vs. Drop-out Value



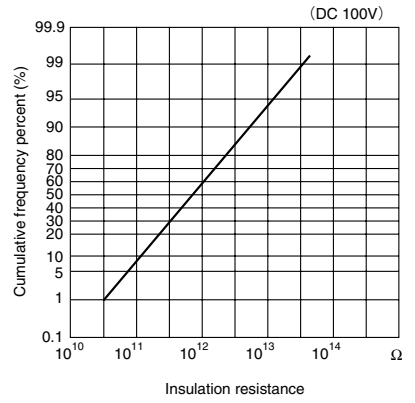
(2) Contact resistance



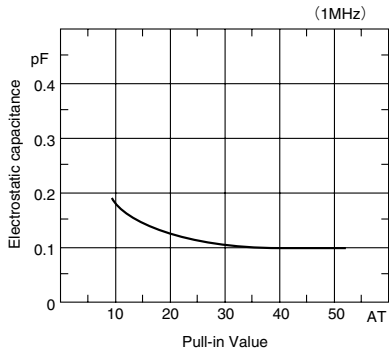
(3) Breakdown voltage



(4) Insulation resistance



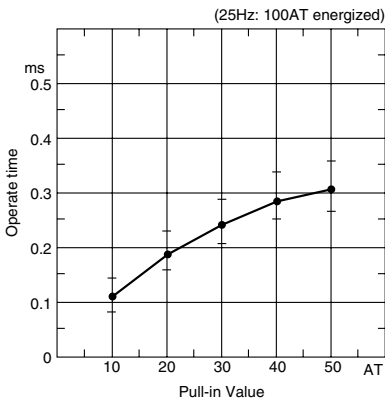
(5) Electrostatic capacitance



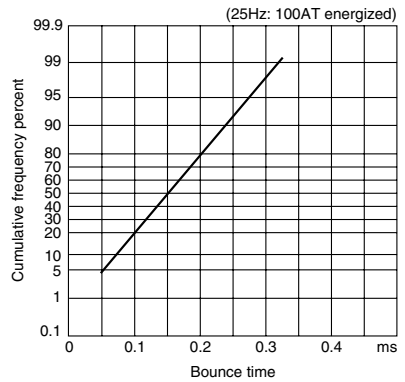
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	0.4max	ms
Bounce time	0.4max	ms
Release time	0.05max	ms
Resonant frequency	3700±400	Hz
Maximum operating frequency	500	Hz

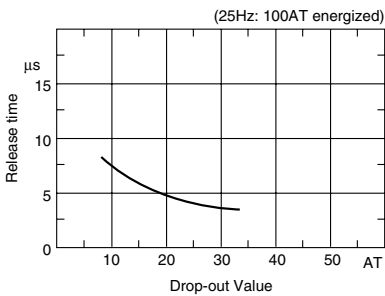
(1) Operate time



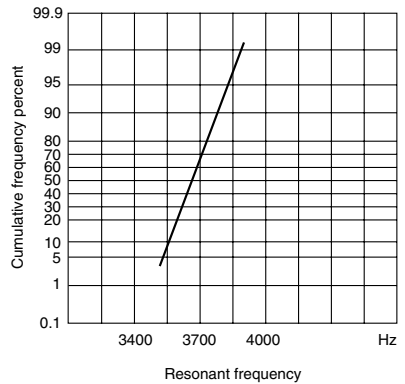
(2) Bounce time



(3) Release time



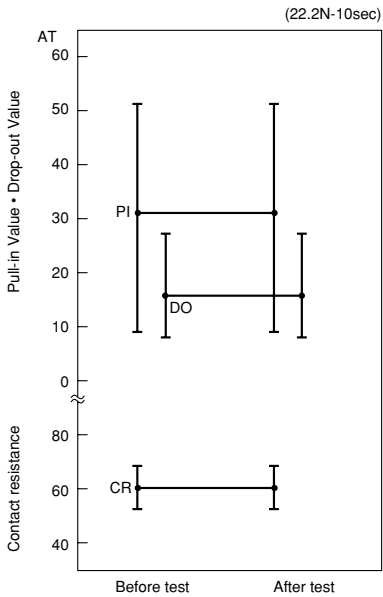
(4) Resonant frequency



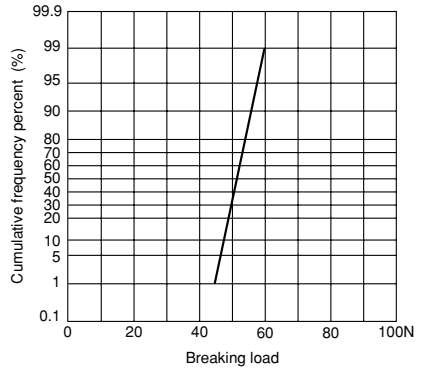
3

■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



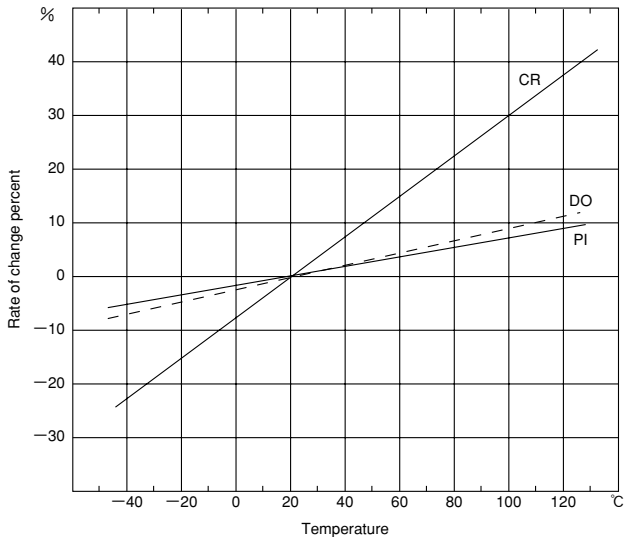
(2) Lead tensile strength



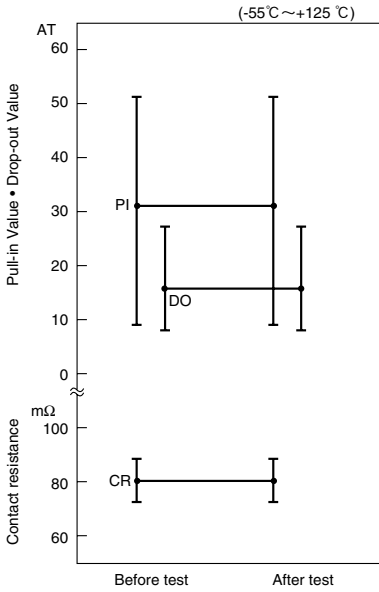
3

■ ENVIRONMENTAL CHARACTERISTICS

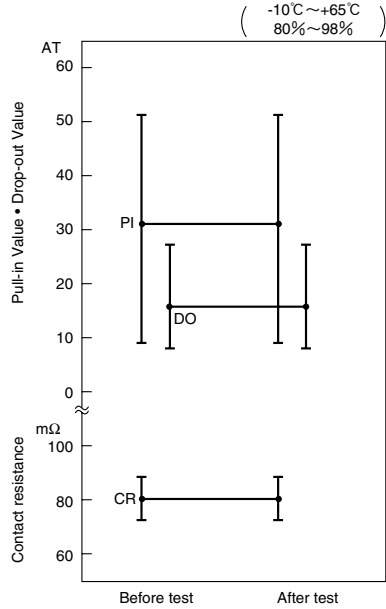
(1) Temperature characteristics



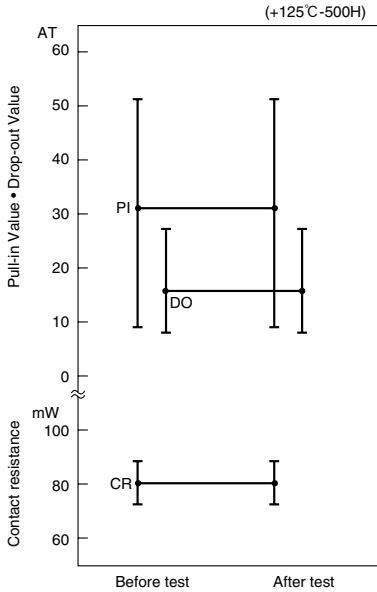
(2) Temperature cycle



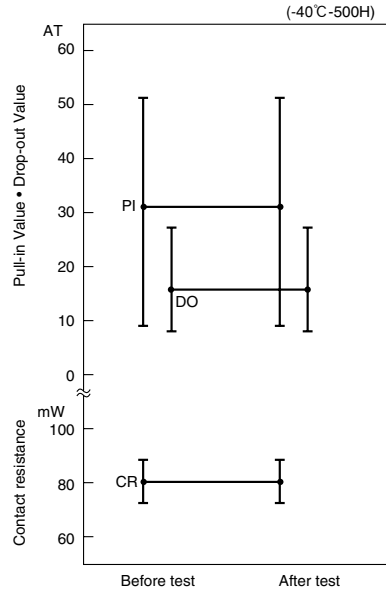
(3) Temperature and humidity cycle



(4) High temperature storage test



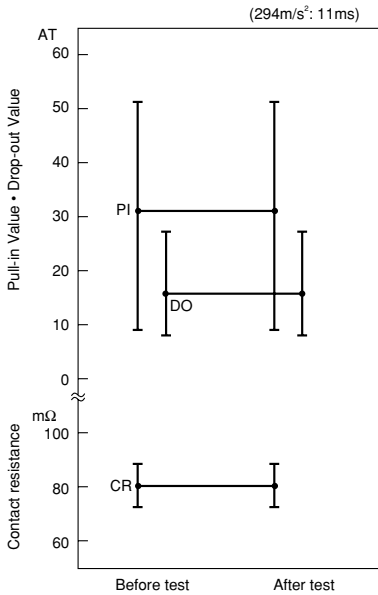
(5) Low temperature storage test



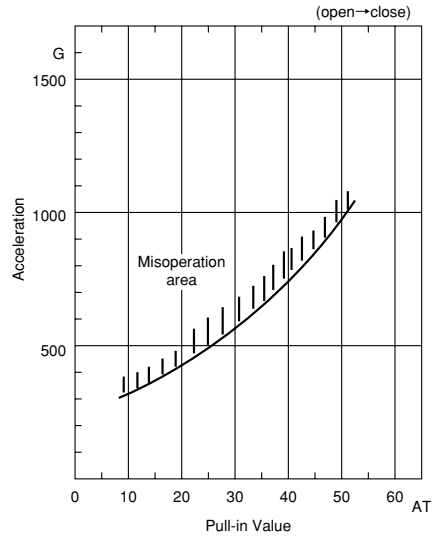
3

(6) Shock test

1) Electrical characteristics

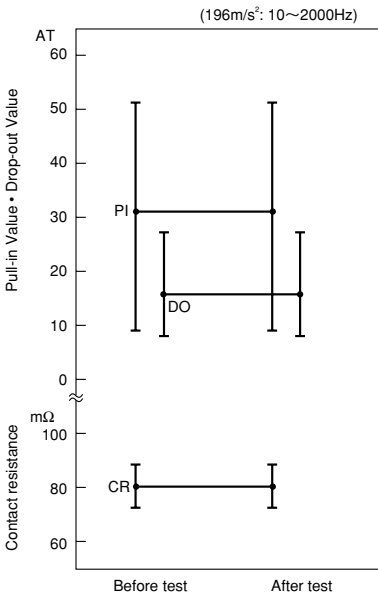


2) Misoperation area



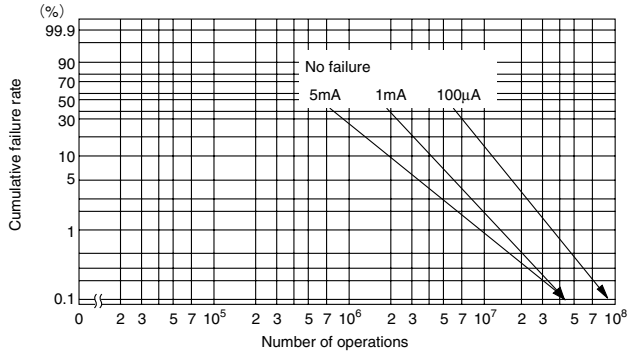
3

(7) Vibration test



■ LIFE EXPECTANCY DATA: ORD9215

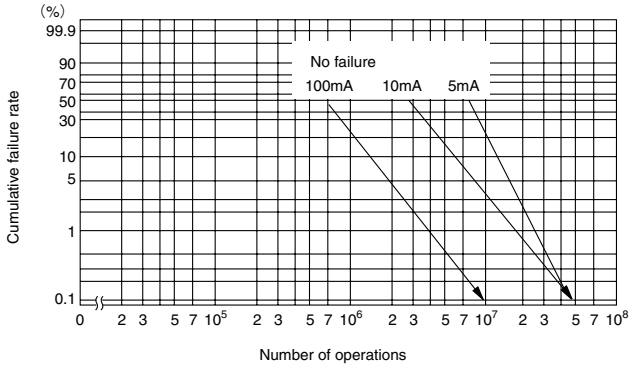
Load conditions
 Voltage: 5VDC
 Current: 100µA 1mA , 5mA
 Load: Resistive load



* Arrow indicates number of operations where test was completed.

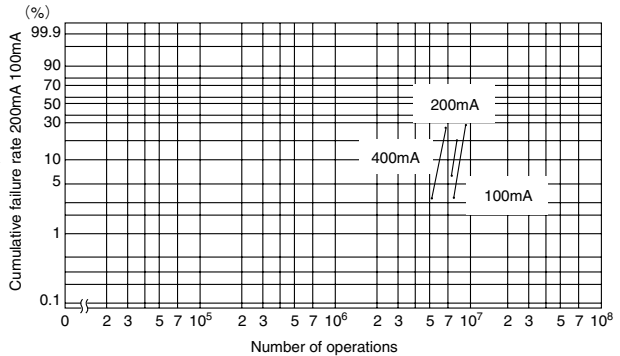
3

Load conditions
 Voltage: 12 VDC
 Current: 5mA, 10mA, 100mA
 Load: Resistive load



* Arrow indicates number of operations where test was completed.

Load conditions
 Voltage: 24 VDC
 Current: 100mA, 200mA, 400mA
 Load: Resistive load



REED SWITCH

ORD9216

General Purpose Miniature

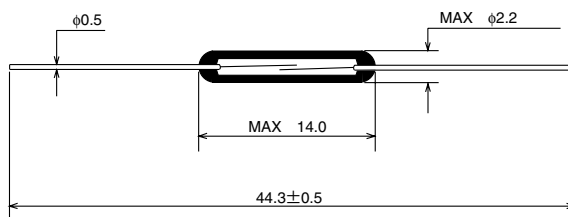
■ GENERAL DESCRIPTION

The ORD9216 is a small single-contact reed switch designed for general control of medium-level loads less than 100 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

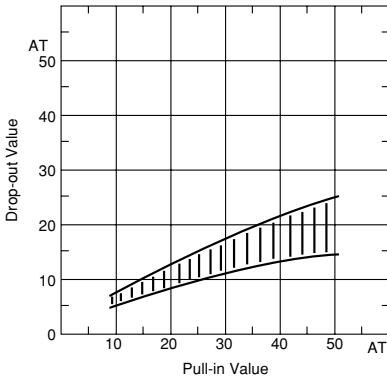
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

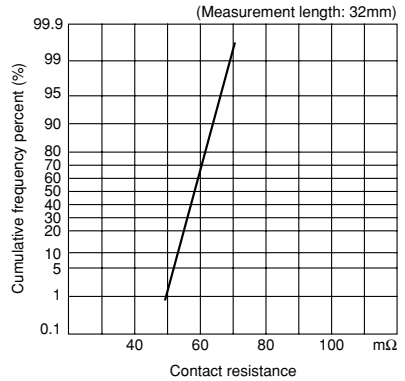
Parameter	Rated value	Unit
Pull-in Value (PI)	10~50	AT
Drop-out Value (DO)	5min	AT
Contact resistance (CR)	100max	mΩ
Breakdown voltage	150min	VDC
Insulation resistance	10 ⁹ min	Ω
Electrostatic capacitance	0.3max	pF
Contact rating	10	VA
Maximum switching voltage	100 $\frac{DC}{AC}$	V
Maximum switching current	0.5	A
Maximum carry current	1.0	A

3

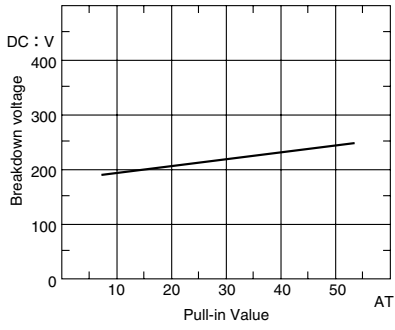
(1) Pull-in Value vs. Drop-out Value



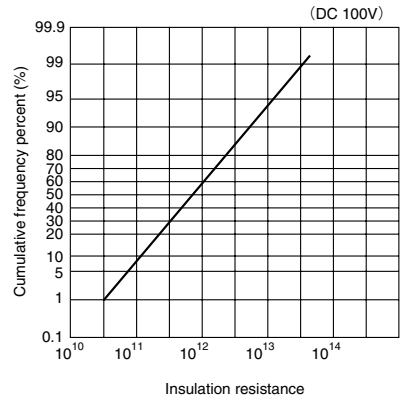
(2) Contact resistance



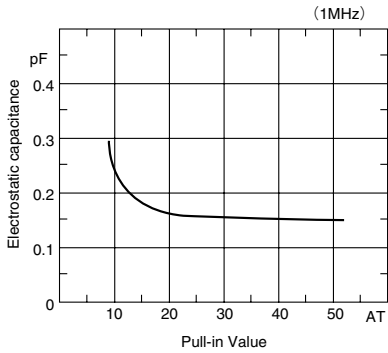
(3) Breakdown voltage



(4) Insulation resistance



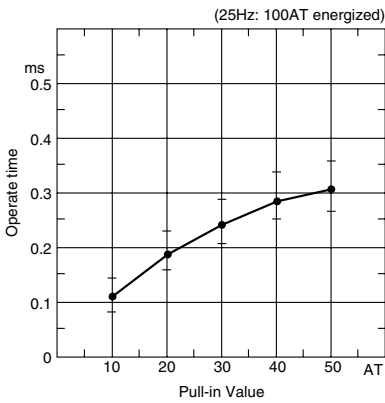
(5) Electrostatic capacitance



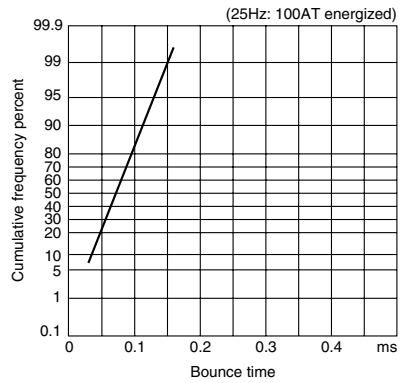
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	0.4max	ms
Bounce time	0.3max	ms
Release time	0.05max	ms
Resonant frequency	5000±400	Hz
Maximum operating frequency	500	Hz

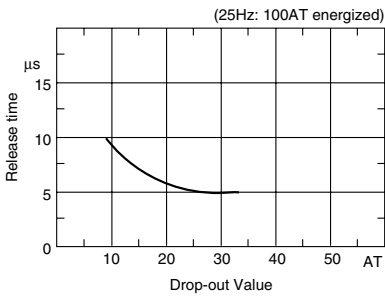
(1) Operate time



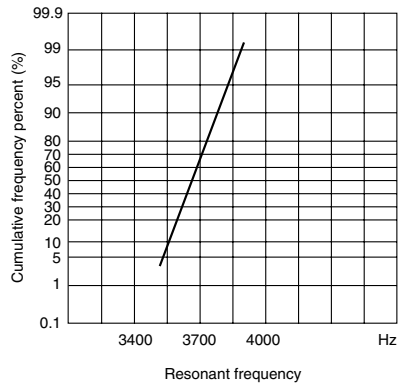
(2) Bounce time



(3) Release time



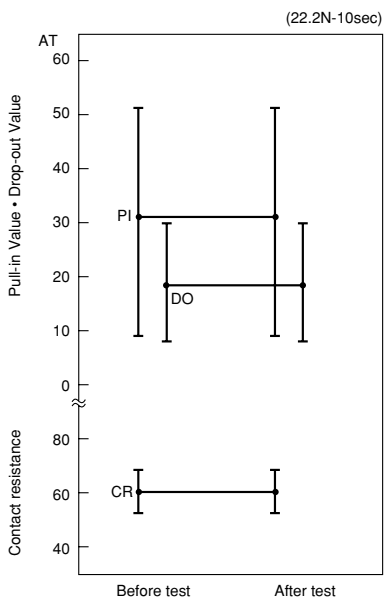
(4) Resonant frequency



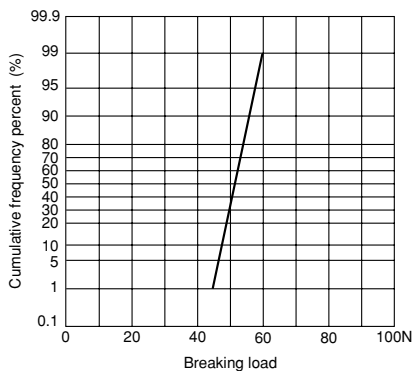
3

■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



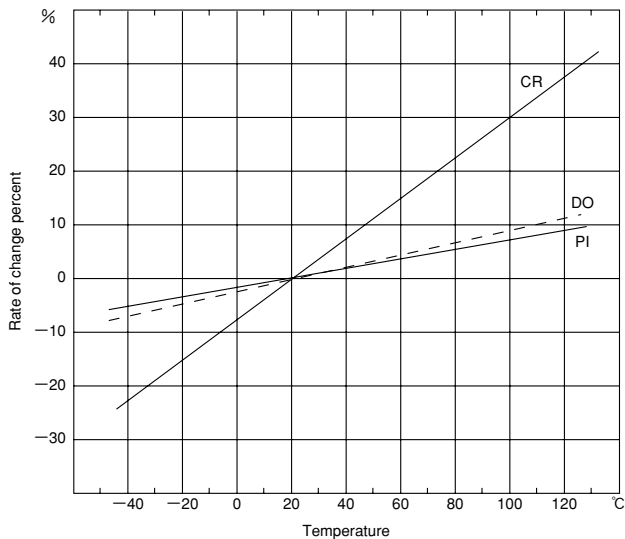
(2) Lead tensile strength



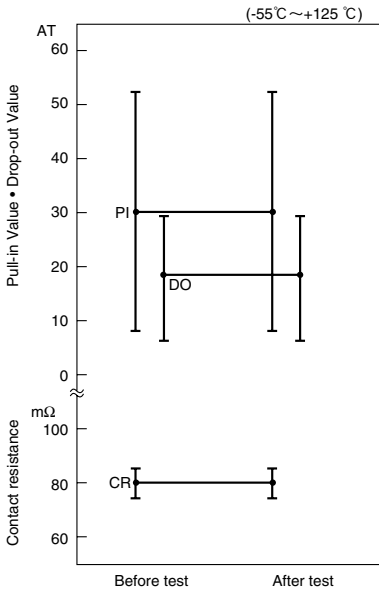
3

■ ENVIRONMENTAL CHARACTERISTICS

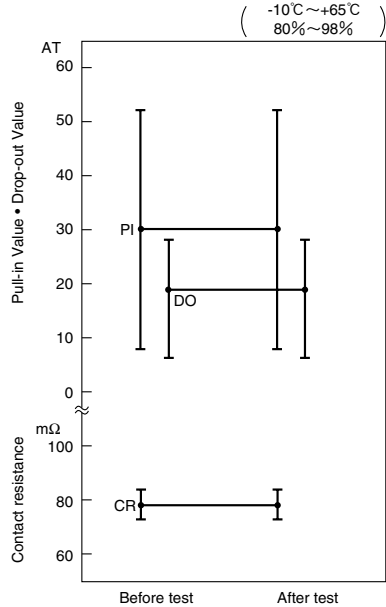
(1) Temperature characteristics



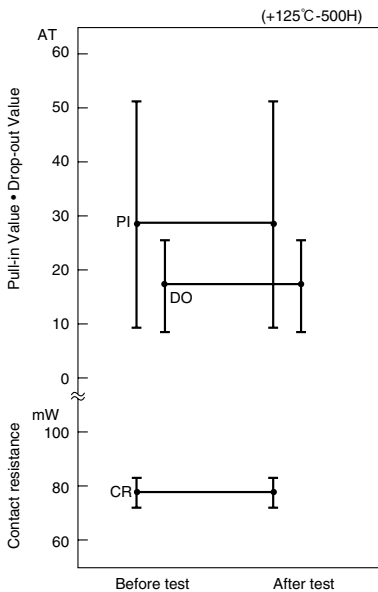
(2) Temperature cycle



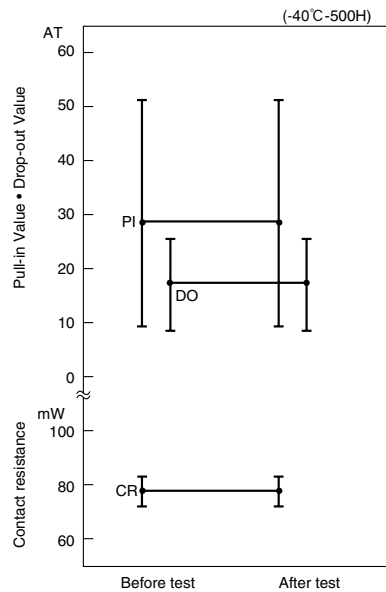
(3) Temperature and humidity cycle



(4) High temperature storage test



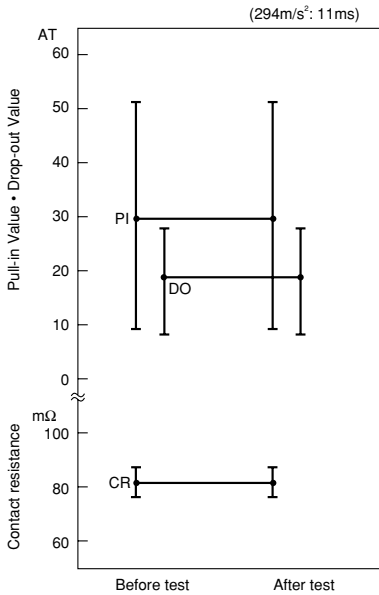
(5) Low temperature storage test



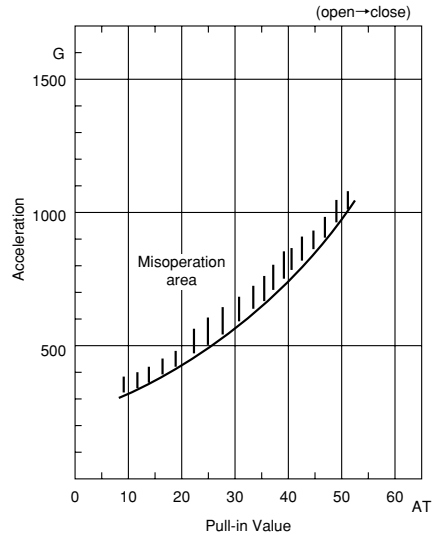
3

(6) Shock test

1) Electrical characteristics

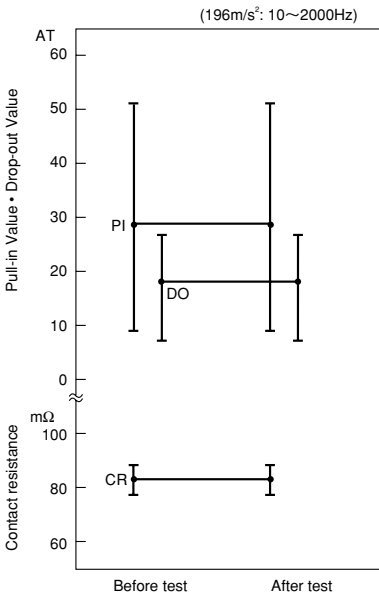


2) Misoperation area



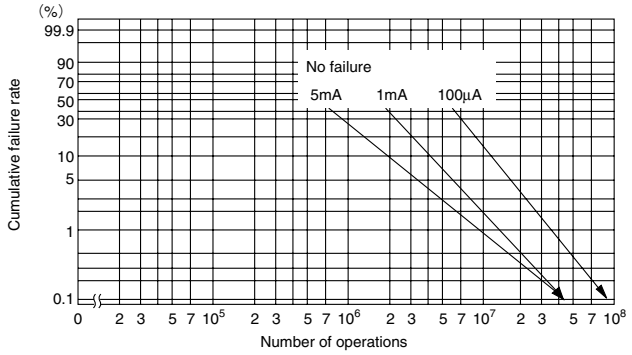
3

(7) Vibration test



■ LIFE EXPECTANCY DATA: ORD9216

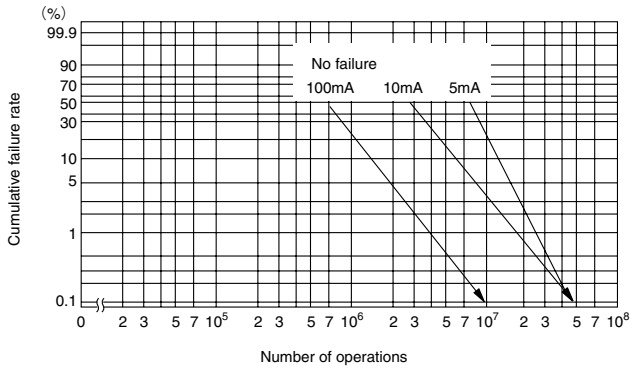
Load conditions
 Voltage: 5VDC
 Current: 100µA 1mA , 5mA
 Load: Resistive load



* Arrow indicates number of operations where test was completed.

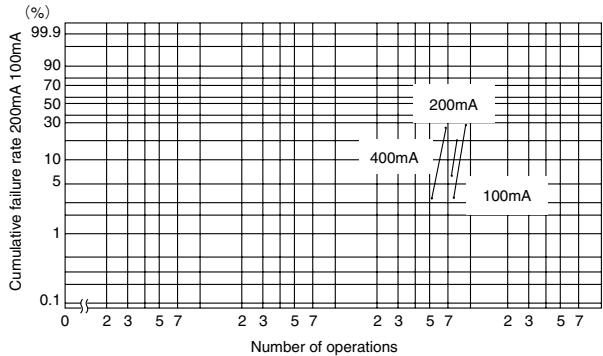
3

Load conditions
 Voltage: 12 VDC
 Current: 5mA, 10mA, 100mA
 Load: Resistive load



* Arrow indicates number of operations where test was completed.

Load conditions
 Voltage: 24 VDC
 Current: 100mA, 200mA, 400mA
 Load: Resistive load



REED SWITCH

ORD311

Super Ultra Miniature Long Life

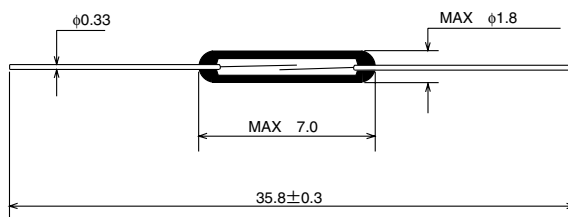
■ GENERAL DESCRIPTION

The ORD311 is a small single-contact reed switch designed for general control of medium level loads less than 100 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed switches are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

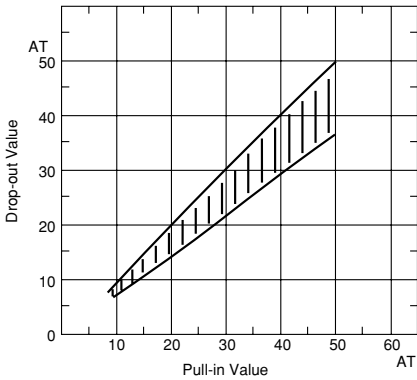
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

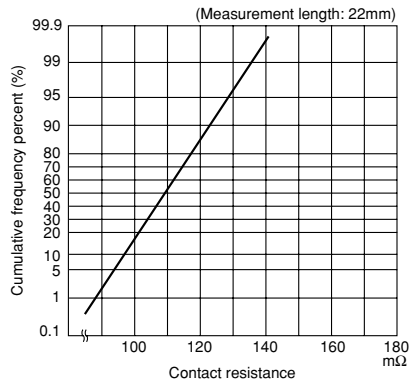
Parameter	Rated value	Unit
Pull-in Value (PI)	10~30	AT
Drop-out Value (DO)	5min	AT
Contact resistance (CR)	200max	mΩ
Breakdown voltage	250min	VDC
Insulation resistance	10 ⁹ min	Ω
Electrostatic capacitance	0.4max	pF
Contact rating	10	VA
Maximum switching voltage	100 $\frac{DC}{AC}$	V
Maximum switching current	0.5	A
Maximum carry current	1.0	A

3

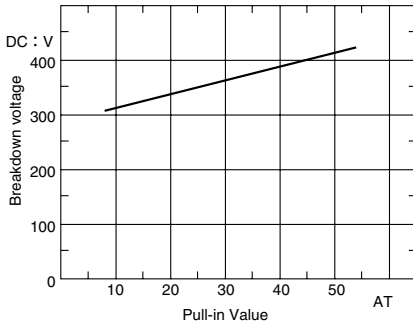
(1) Pull-in Value vs. Drop-out Value



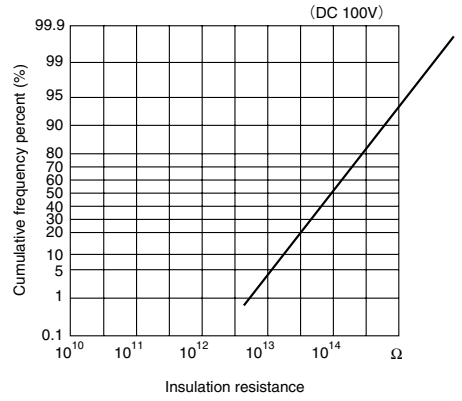
(2) Contact resistance



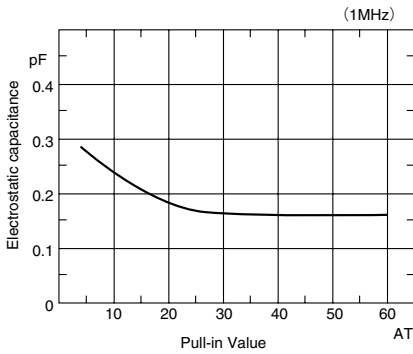
(3) Breakdown voltage



(4) Insulation resistance



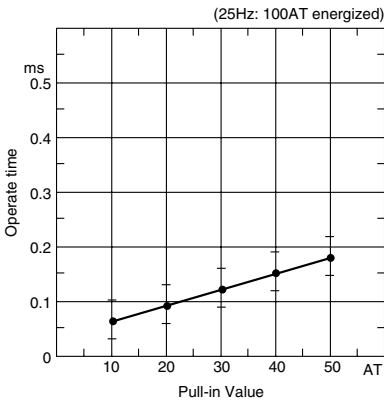
(5) Electrostatic capacitance



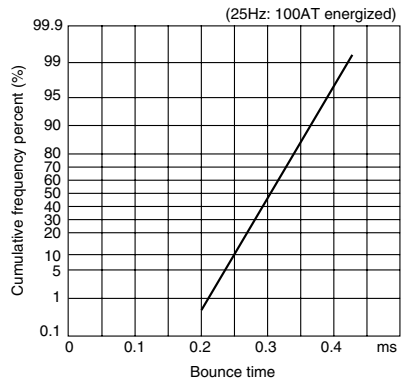
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	0.3max	ms
Bounce time	0.3max	ms
Release time	0.05max	ms
Resonant frequency	13000±2000	Hz
Maximum operating frequency	500	Hz

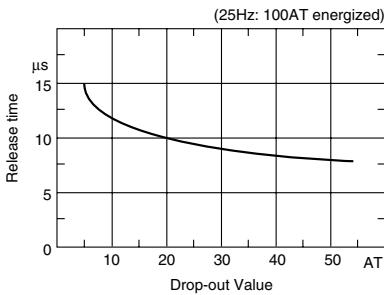
(1) Operate time



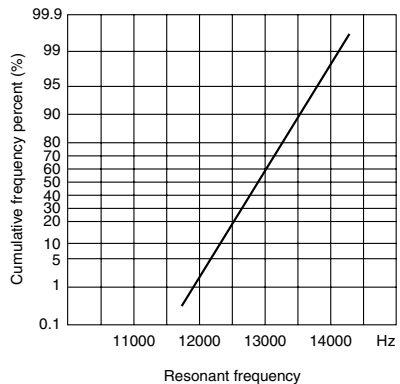
(2) Bounce time



(3) Release time



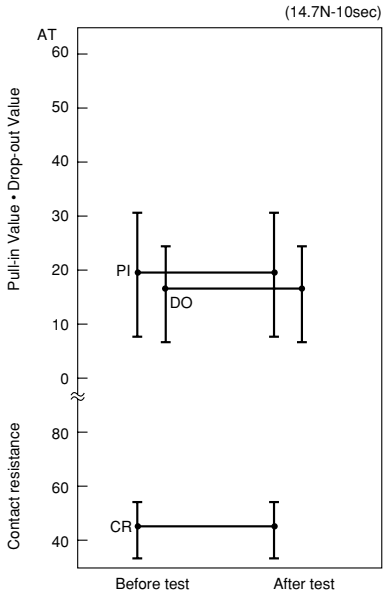
(4) Resonant frequency



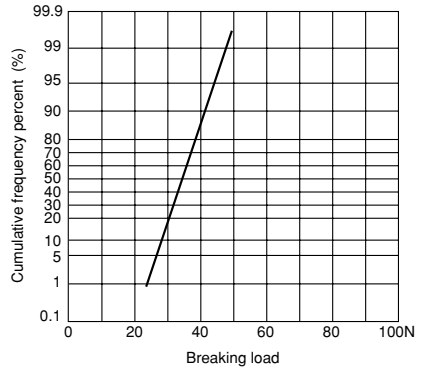
3

■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



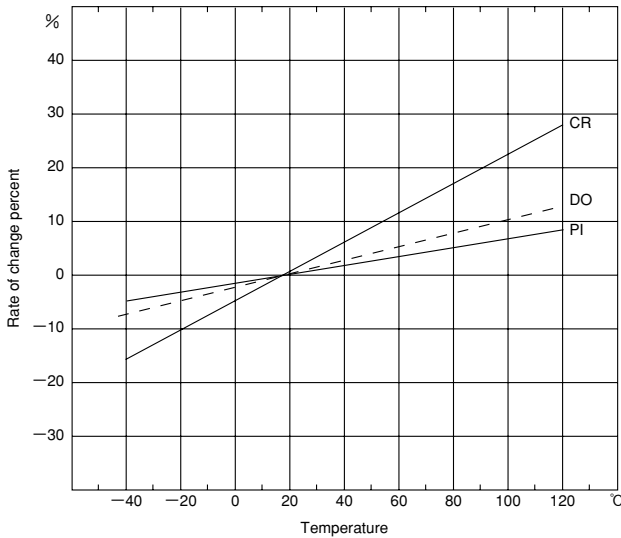
(2) Lead tensile strength



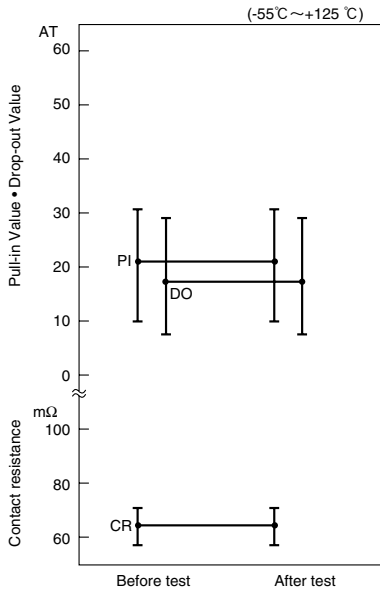
3

■ ENVIRONMENTAL CHARACTERISTICS

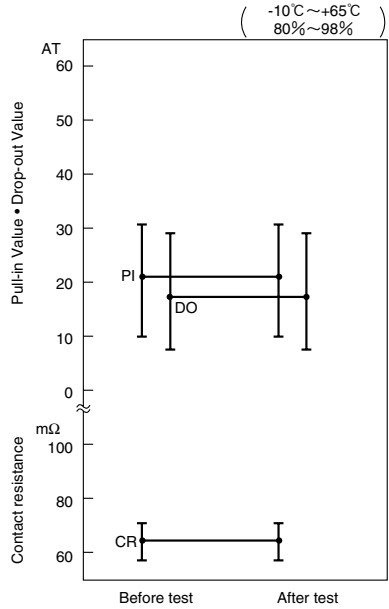
(1) Temperature characteristics



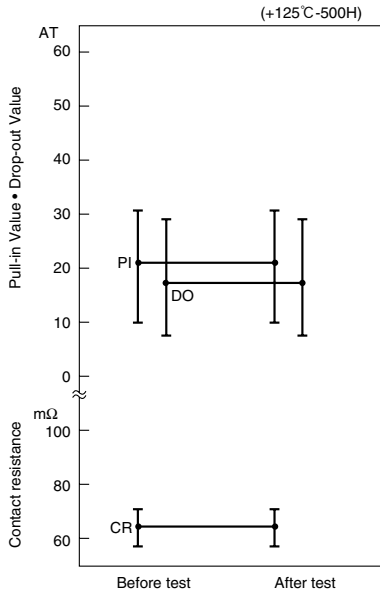
(2) Temperature cycle



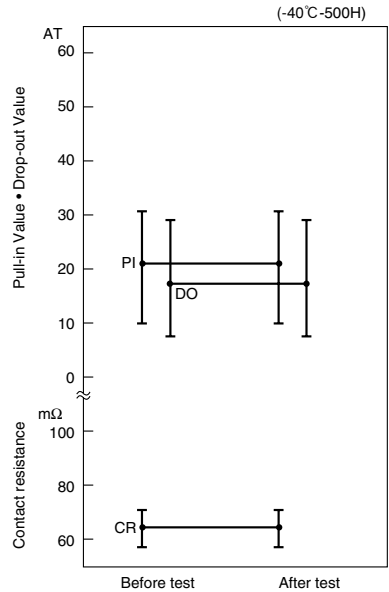
(3) Temperature and humidity cycle



(4) High temperature storage test



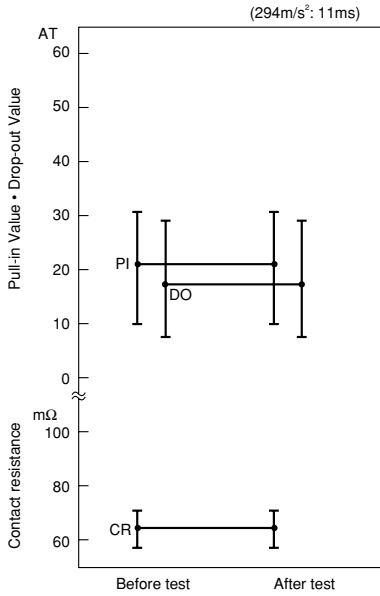
(5) Low temperature storage test



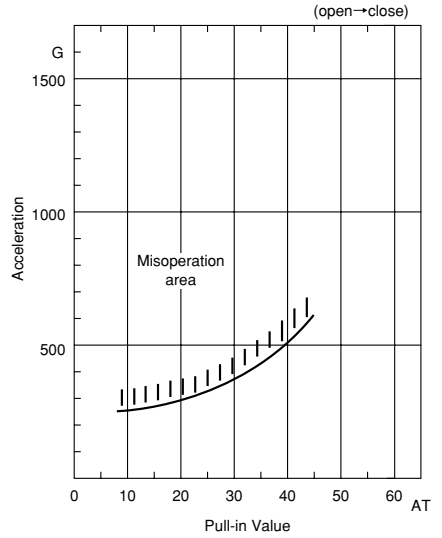
3

(6) Shock test

1) Electrical characteristics

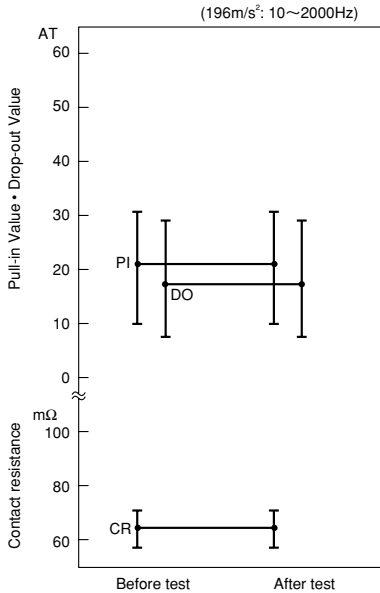


2) Misoperation area



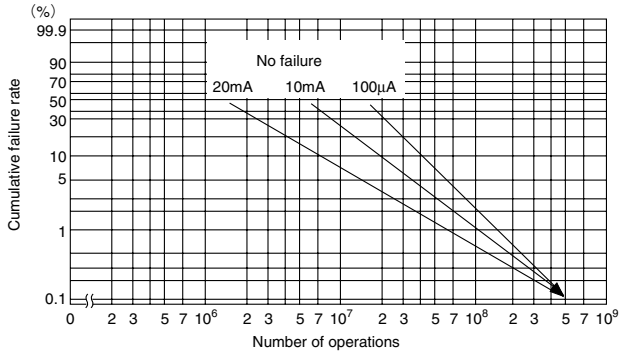
3

(7) Vibration test



■ LIFE EXPECTANCY DATA: ORD311

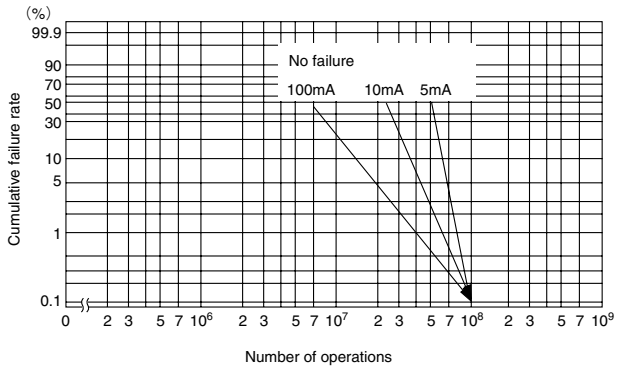
Load conditions
 Voltage: 5VDC
 Current: 100µA, 10mA, 20mA
 Load: Resistive load



* Arrow indicates number of operations where test was completed.

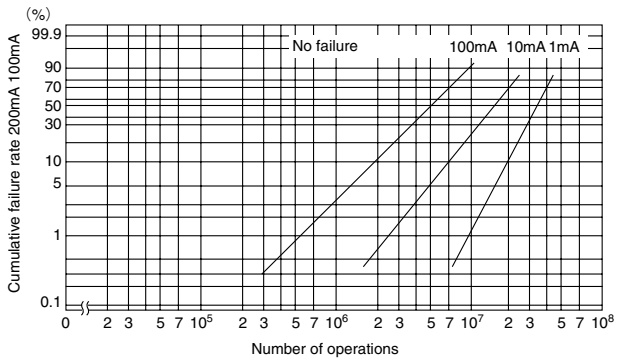
3

Load conditions
 Voltage: 12 VDC
 Current: 5mA, 10mA, 100mA
 Load: Resistive load



* Arrow indicates number of operations where test was completed.

Load conditions
 Voltage: 24 VDC
 Current: 1mA, 10mA, 100mA
 Load: Resistive load



* Arrow indicates number of operations where test was completed.

REED SWITCH

ORD312

High Power Long Life

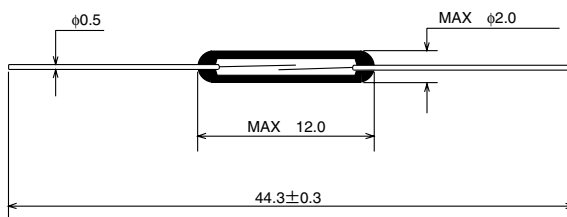
■ GENERAL DESCRIPTION

The ORD312 is a small single-contact reed switch designed for general control of medium level loads less than 200 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

- (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
- (2) Quick response
- (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
- (4) Reed switches are compact and light weight.
- (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
- (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

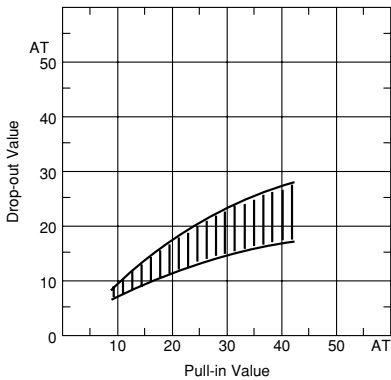
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

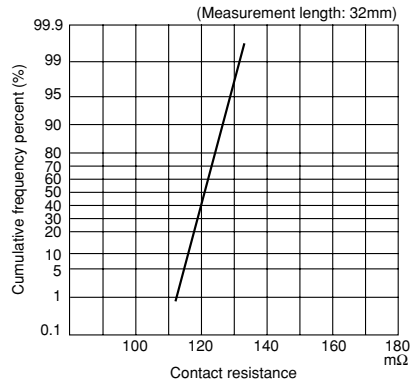
Parameter	Rated value	Unit
Pull-in Value (PI)	10~30	AT
Drop-out Value (DO)	5min	AT
Contact resistance (CR)	100max	mΩ
Breakdown voltage	250min	VDC
Insulation resistance	10 ⁹ min	Ω
Electrostatic capacitance	0.3max	pF
Contact rating	30	VA
Maximum switching voltage	200DC	V
	100AC	V
Maximum switching current	0.5	A
Maximum carry current	1.0	A

3

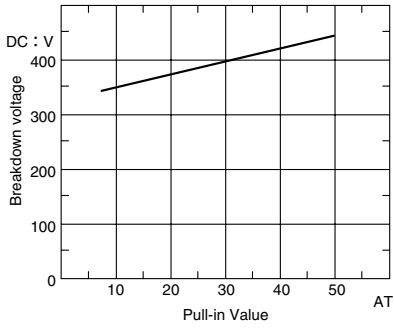
(1) Pull-in Value vs. Drop-out Value



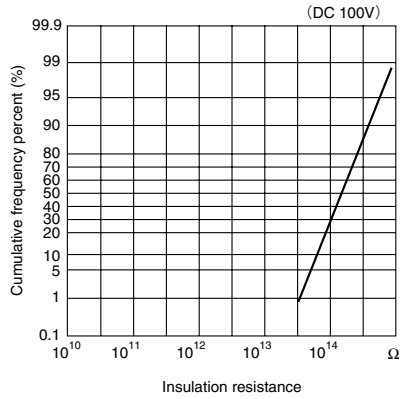
(2) Contact resistance



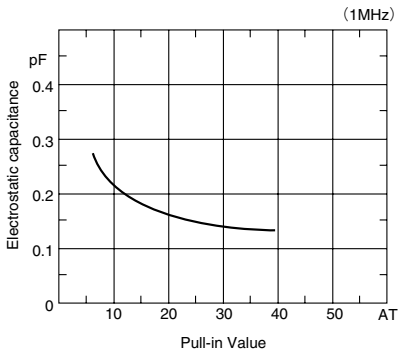
(3) Breakdown voltage



(4) Insulation resistance



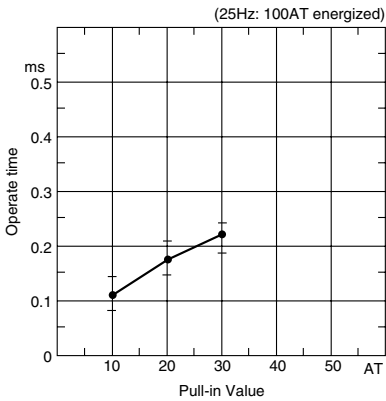
(5) Electrostatic capacitance



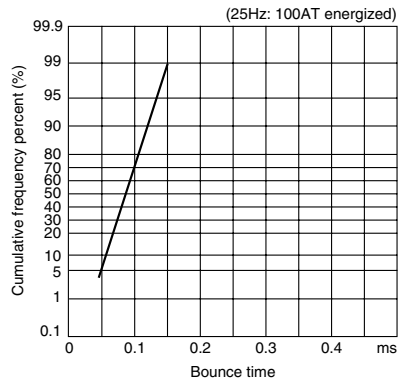
■ OPERATING CHARACTERISTICS

Parameter	Rated value	Unit
Operate time	0.4max	ms
Bounce time	0.3max	ms
Release time	0.05max	ms
Resonant frequency	5900±400	Hz
Maximum operating frequency	500	Hz

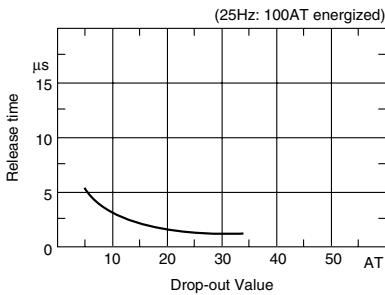
(1) Operate time



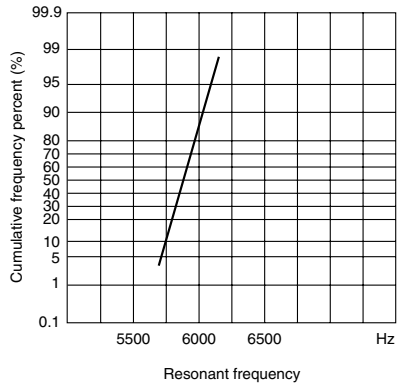
(2) Bounce time



(3) Release time

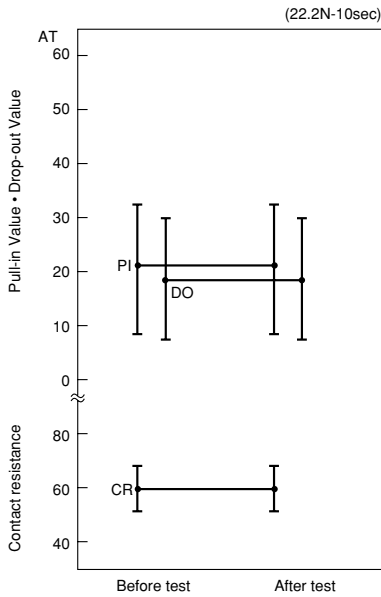


(4) Resonant frequency

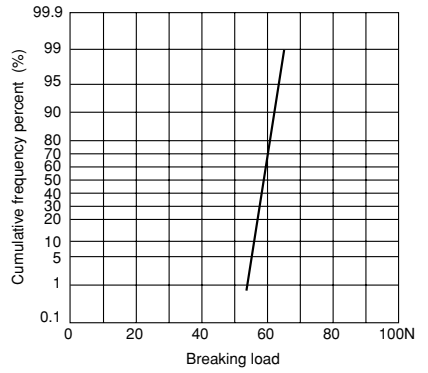


■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)



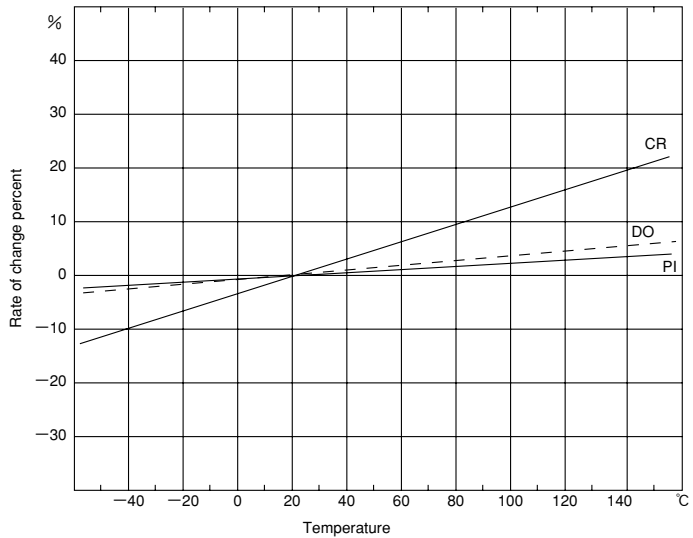
(2) Lead tensile strength



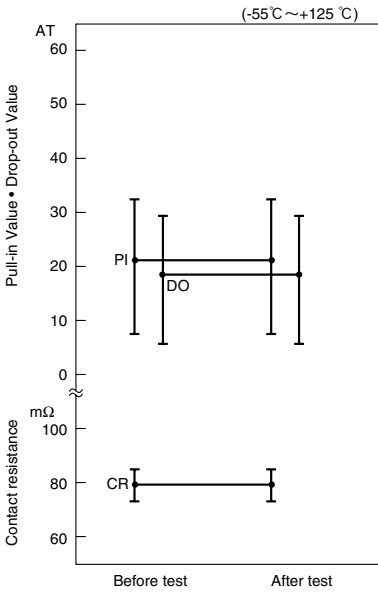
3

■ ENVIRONMENTAL CHARACTERISTICS

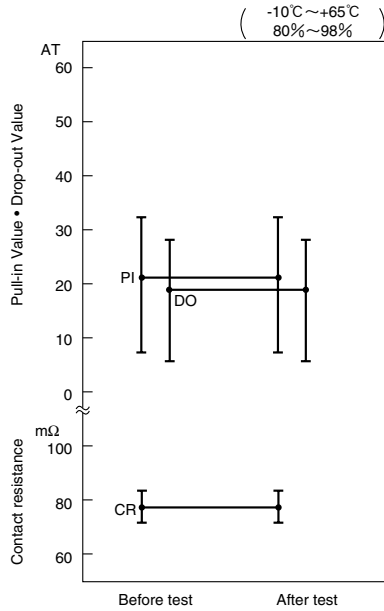
(1) Temperature characteristics



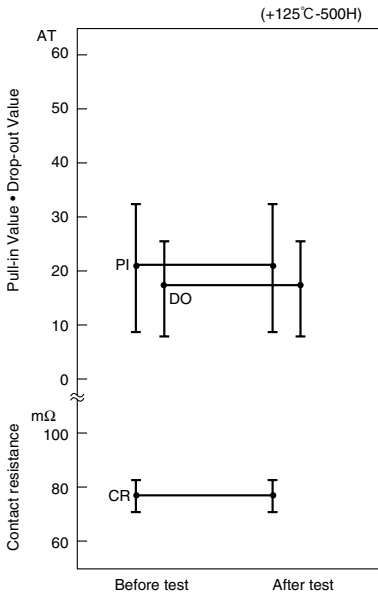
(2) Temperature cycle



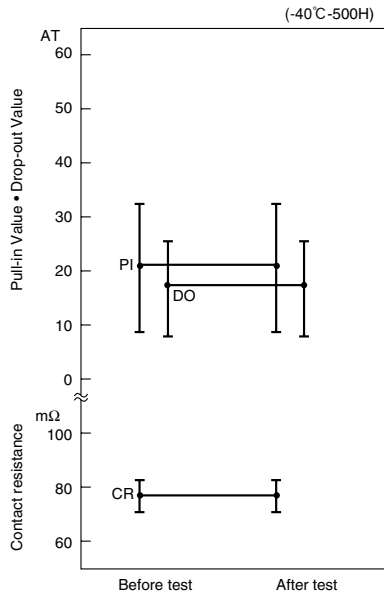
(3) Temperature and humidity cycle



(4) High temperature storage test



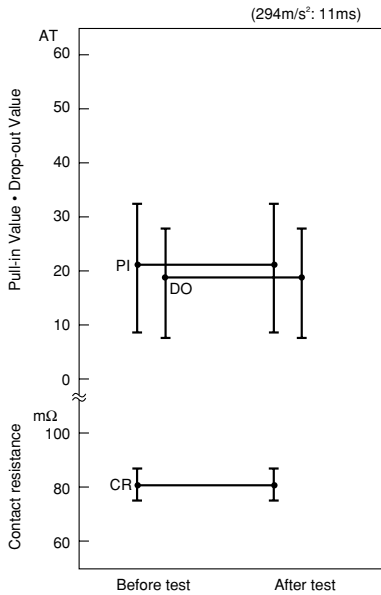
(5) Low temperature storage test



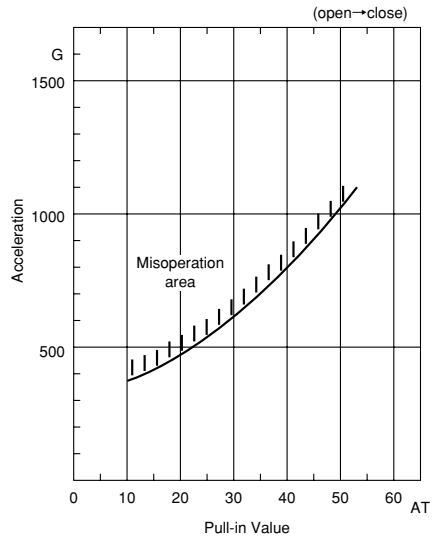
3

(6) Shock test

1) Electrical characteristics

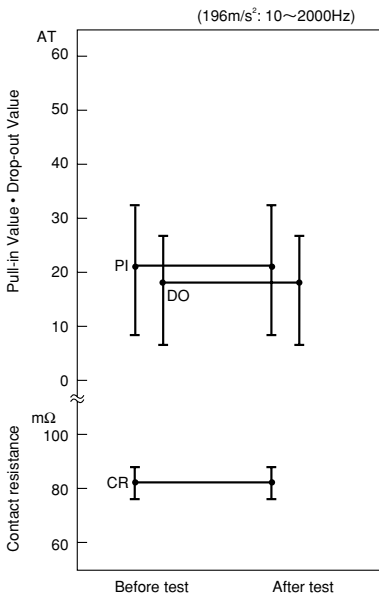


2) Misoperation area



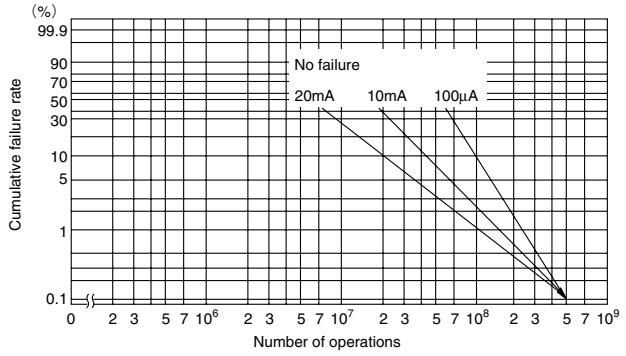
3

(7) Vibration test



■ LIFE EXPECTANCY DATA: ORD312

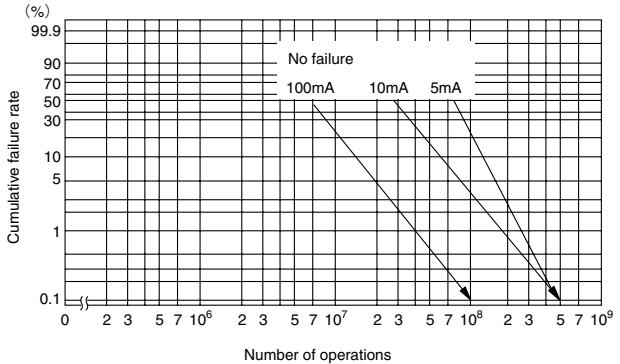
Load conditions
 Voltage: 5VDC
 Current: 100μA, 10mA, 20mA
 Load: Resistive load



* Arrow indicates number of operations where test was completed.

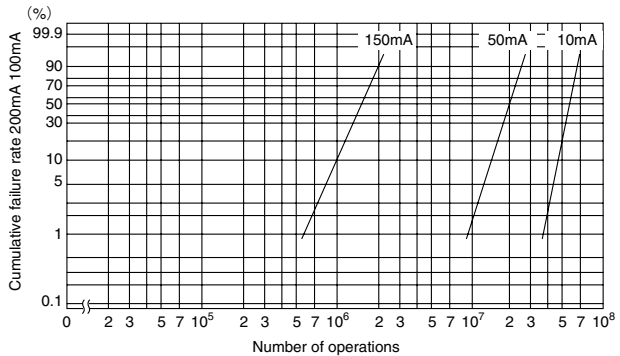
3

Load conditions
 Voltage: 12VDC
 Current: 5mA, 10mA, 100mA
 Load: Resistive load



* Arrow indicates number of operations where test was completed.

Load conditions
 Voltage: 200VDC
 Current: 10mA, 50mA, 150mA
 Load: Resistive load



* Arrow indicates number of operations where test was completed.

MOLDED SWITCH

RA-901

Miniature SMD

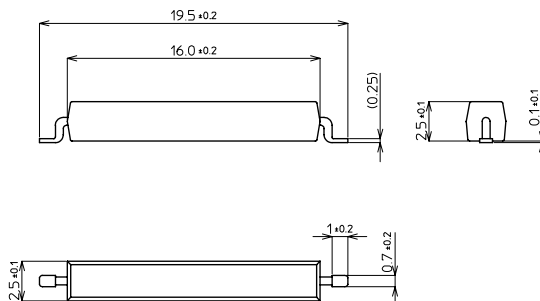
■ GENERAL DESCRIPTION

The RA-901 is a molded switch made by molding the glass tube of ORD228VL with resin and processing the leads. It ensures ease of handling of the switch while maintaining the excellent characteristics of the ORD228VL.

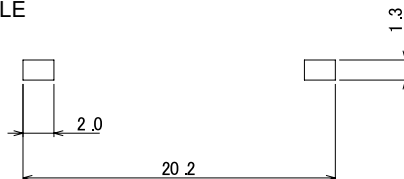
■ FEATURES

- (1) It has a gull wing shape lead suitable for SMT.
- (2) Automatic mounting of component by tape and reel.
- (3) It features enhanced shock resistance characteristics due to resin mold that protects the glass tube.
- (4) General Purpose Miniature

■ EXTERNAL DIMENSIONS (Unit: mm)



■ PAD LAYOUT SAMPLE



■ APPLICATIONS

- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ SPECIFICATION

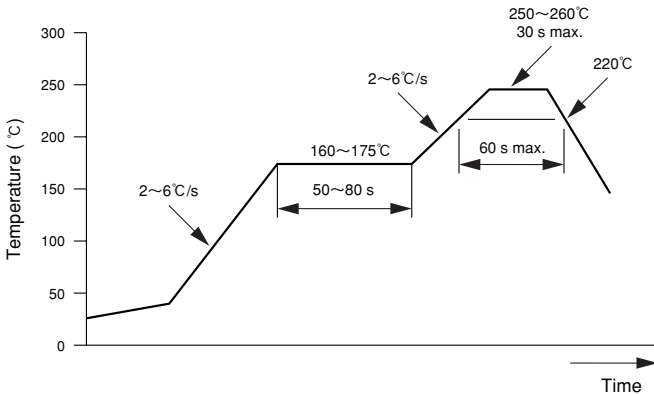
Contact form	1A
Pull-in value (PI)	15~49AT
Drop-out value (DO)	10AT (Min.)
Contact resistance (CR)	100mΩ (Max.)
Contact rating	10W (Max.)
Maximum switching voltage	100V
Maximum switching current	0.5A
Maximum carry current	1.0A
Breakdown voltage	200V (Min.)
Insulation resistance	$1 \times 10^9 \Omega$ (Min.)
Operate time	0.4ms (Max.)
Bounce time	0.3ms (Max.)
Release time	0.05ms (Max.)
Shock resistance	490m/s ² - 11ms
Vibration resistance	490m/s ² (10~2000Hz)
Operating temperature range	-40~125°C
Storage temperature range	-50~125°C

3

■ PULL-IN VALUE TABLE (After forming)

Model No.	1	2	3	4	5	6	7	8
Pull-in value (AT)	15~34	18~36	19~39	21~42	24~45	27~49	30~49	34~49

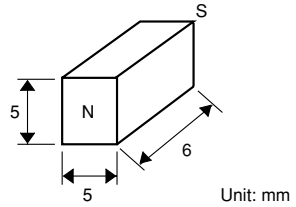
■ Reflow conditions



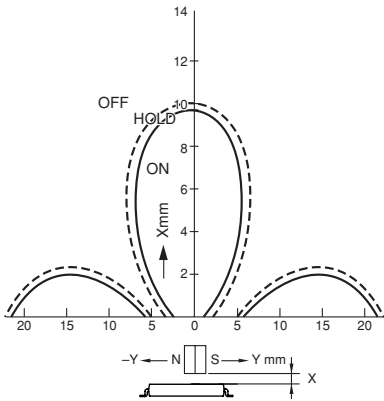
■ Magnet drive characteristics example (1)

Magnet: 5 x 5 x 6 mm
 Anisotropic barium ferrite
 Surface magnetic flux 120 mT

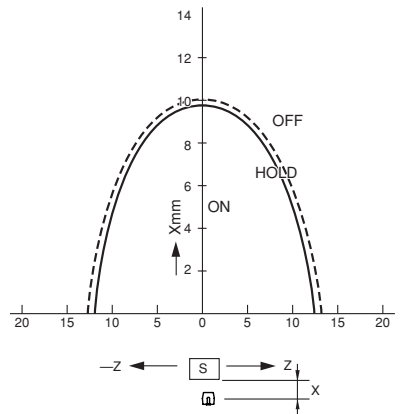
Molded switch: RA-901-1
 Pull-in value 15.0 (AT)
 Drop-out value 13.5 (AT)



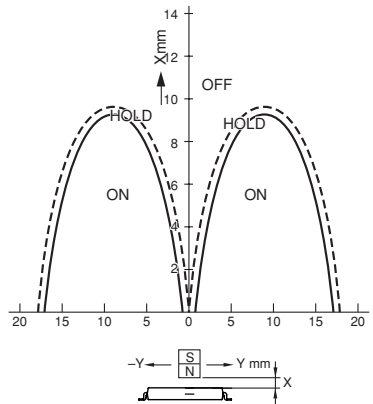
(1) X-Y characteristic H



(2) X-Z characteristic H



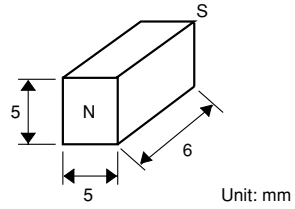
(3) X-Y characteristic V



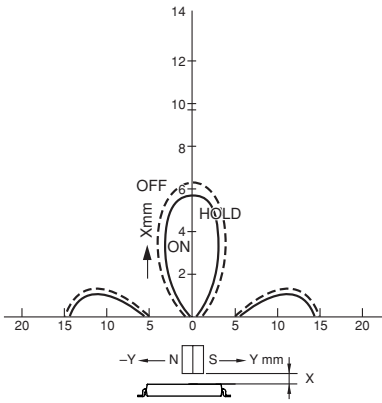
■ RA-901 Magnet drive characteristics example (2)

Magnet: 5 x 5 x 6 mm
 Anisotropic barium ferrite
 Surface magnetic flux 120 mT

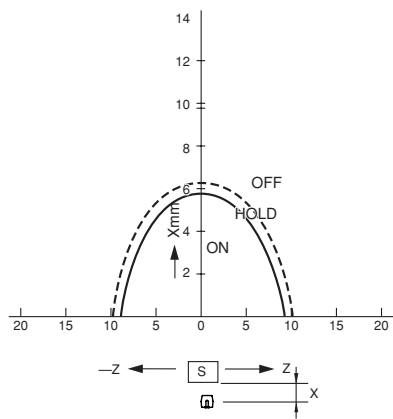
Molded switch: RA-901-1
 Pull-in value 34.0 (AT)
 Drop-out value 29.1 (AT)



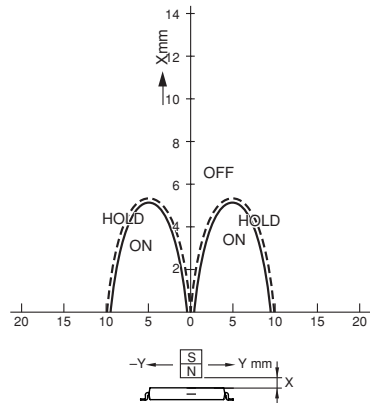
(1) X-Y characteristic H



(2) X-Z characteristic H



(3) X-Y characteristic V

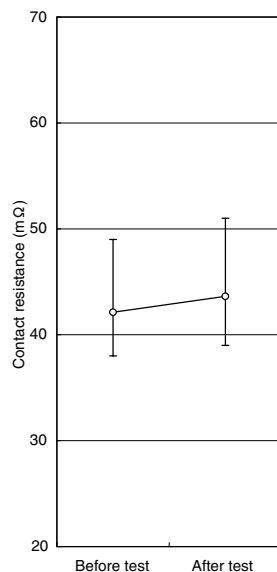
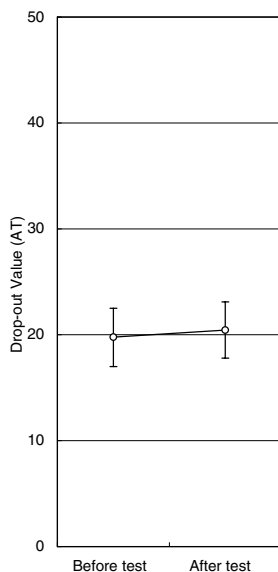
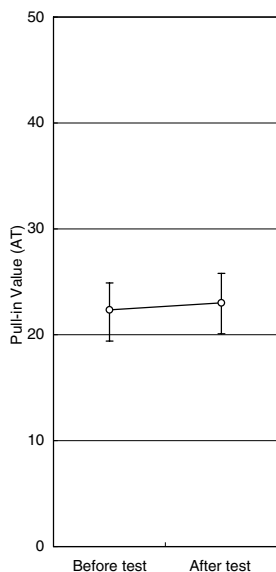


3

■ ENVIRONMENTAL CHARACTERISTICS

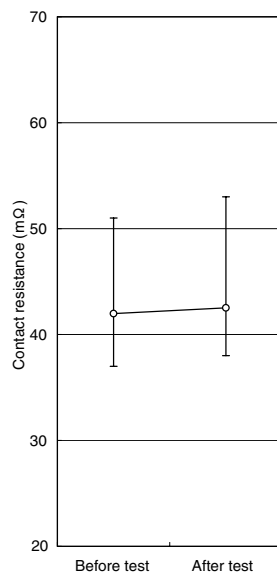
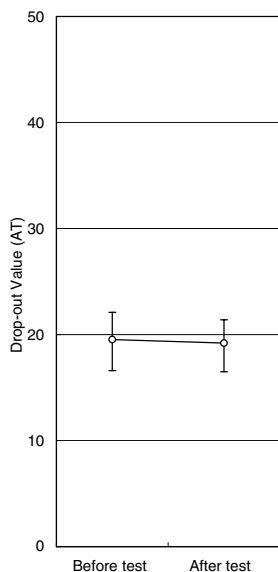
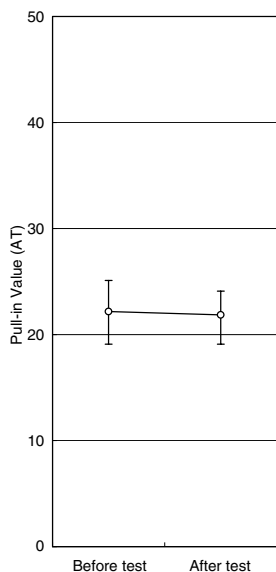
(1) Temperature cycle

(-55°C ~ +125°C)

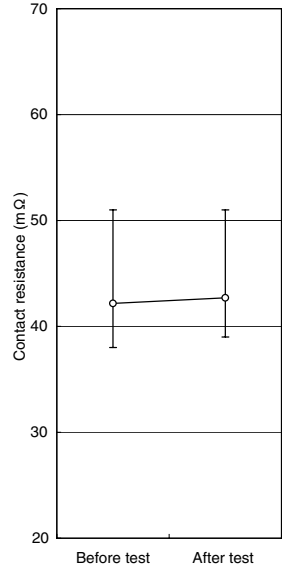
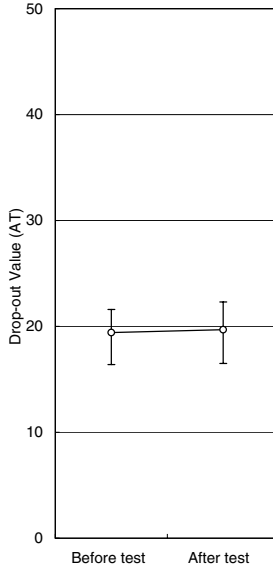
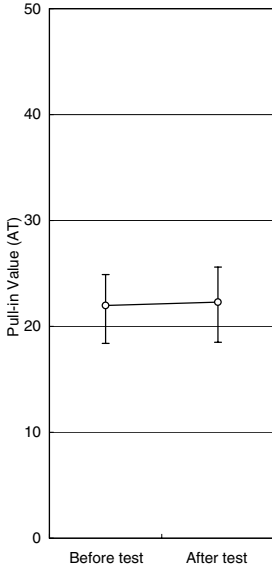


(2) Temperature and humidity cycle

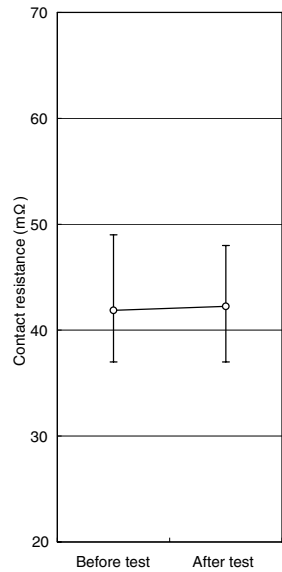
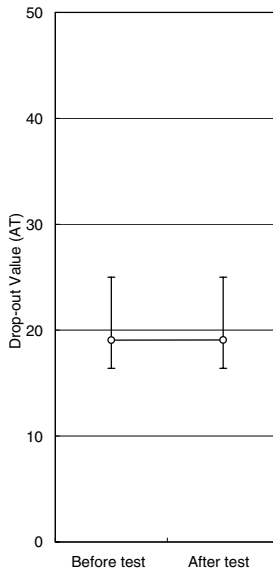
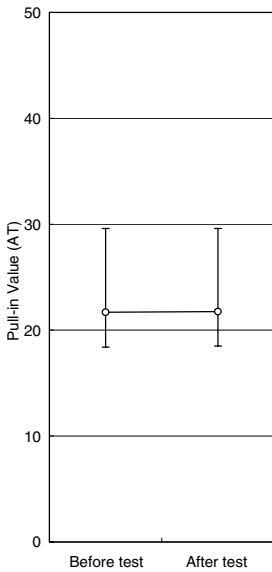
(-10°C ~ +65°C 80% ~ 98%)



(3) High temperature storage test (125°C 500H)

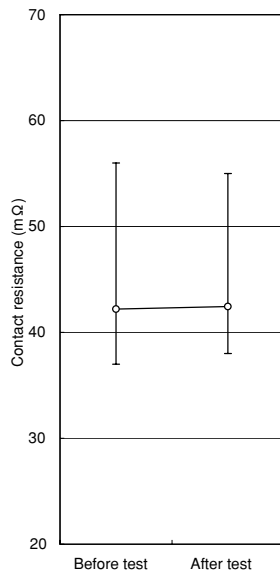
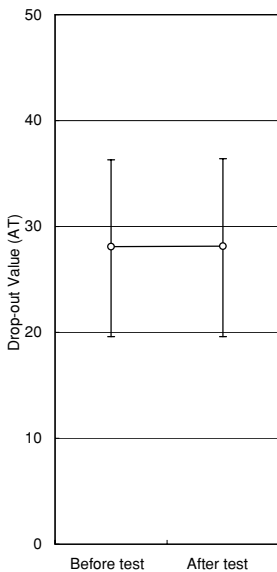
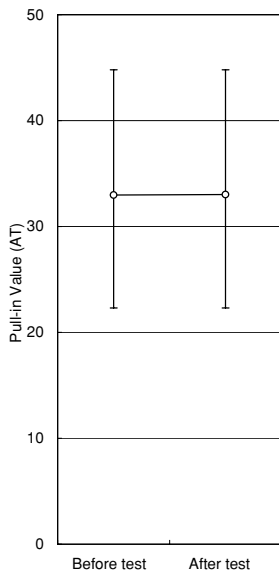


(4) Low temperature storage test (-40°C 500H)

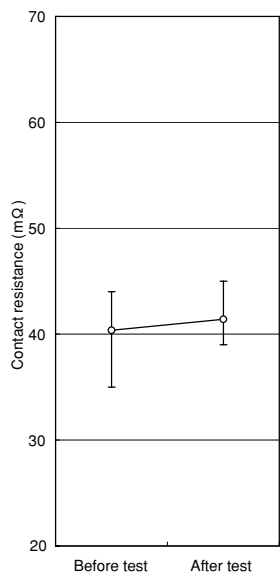
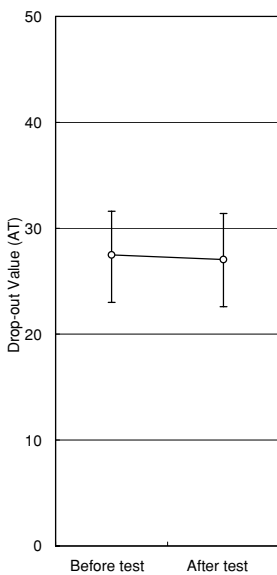
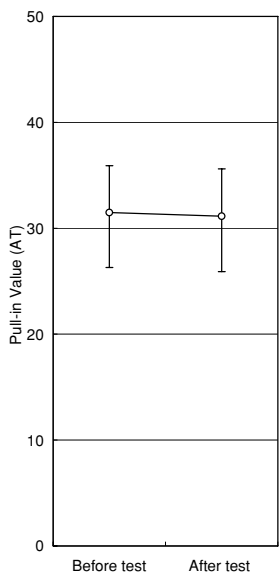


3

(5) Shock test

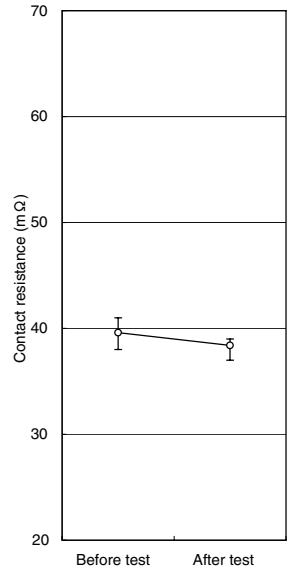
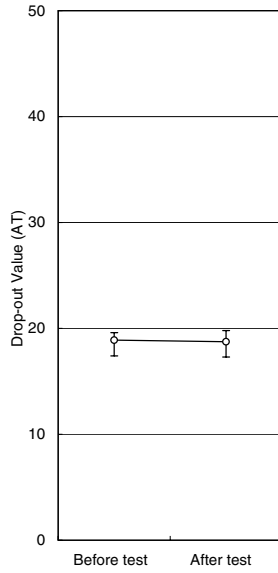
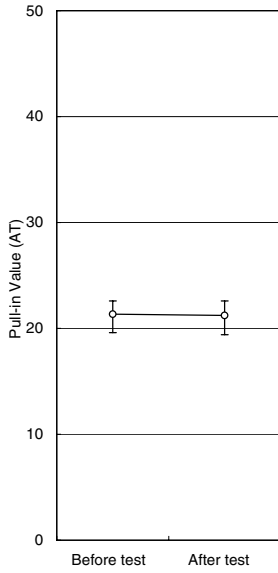
(490m/s² 11msec)

(6) Vibration test

(490m/s² 10~2000Hz)

(7) Shock Resistance test

(ϕ 10mm steel ball free fall impact height 230 mm)



3

MOLDED SWITCH

RA-903

Ultra Miniature SMD

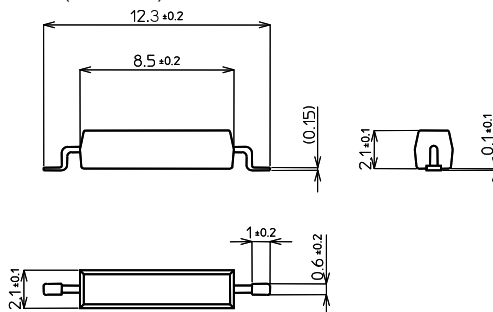
■ GENERAL DESCRIPTION

The RA-903 is a molded switch made by molding the glass tube of ORD213 with resin and processing the leads. It ensures ease of handling while maintaining the excellent features of the ORD213 and its light weight.

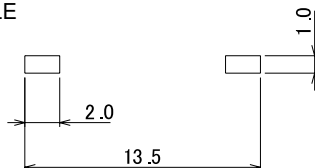
■ FEATURES

- (1) It has a gull wing shape lead suitable for SMT.
- (2) Automatic mounting of this component by tape and reel.
- (3) It features enhanced shock resistance characteristics due to resin mold that protects the glass tube.
- (4) Ultracompact and light weight

■ EXTERNAL DIMENSIONS (Unit: mm)



■ PAD LAYOUT SAMPLE



■ APPLICATIONS

- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ SPECIFICATION

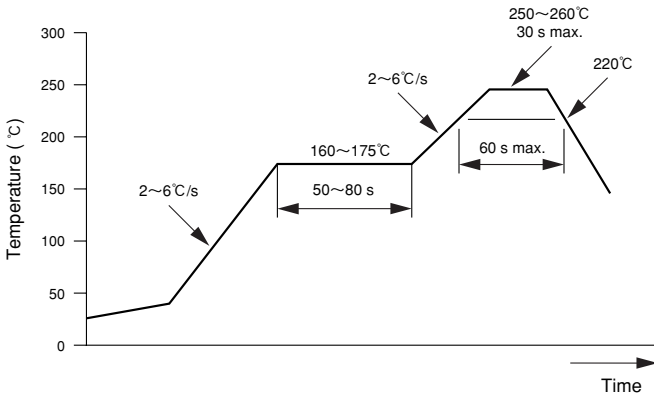
Contact form	1A
Pull-in value (PI)	16~46AT
Drop-out value (DO)	10AT (Min.)
Contact resistance (CR)	200mΩ (Max.)
Contact rating	1W (Max.)
Maximum switching voltage	24V
Maximum switching current	0.1A
Maximum carry current	0.3A
Breakdown voltage	150V (Min.)
Insulation resistance	1×10 ⁹ Ω (Min.)
Operate time	0.3ms (Max.)
Bounce time	0.3ms (Max.)
Release time	0.05ms (Max.)
Shock resistance	490m/s ² - 11ms
Vibration resistance	490m/s ² (10~2000Hz)
Operating temperature range	-40~125°C
Storage temperature range	-50~125°C

3

■ PULL-IN VALUE TABLE (After forming)

Model No.	1	2	3	4	5	6
Pull-in value (AT)	16~29	18~32	20~34	22~36	24~42	28~46

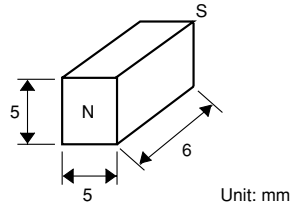
■ Reflow conditions



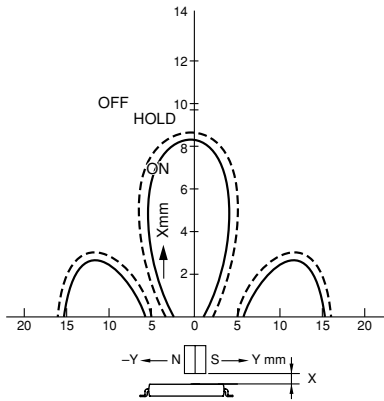
■ Magnet drive characteristics example (1)

Magnet: 5 x 5 x 6 mm
 Anisotropic barium ferrite
 Surface magnetic flux 120 mT

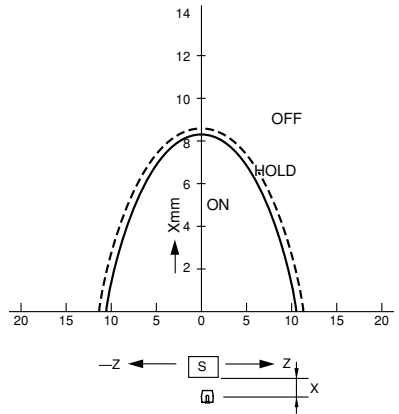
Molded switch: RA-901-1
 Pull-in value 16.8 (AT)
 Drop-out value 15.9 (AT)



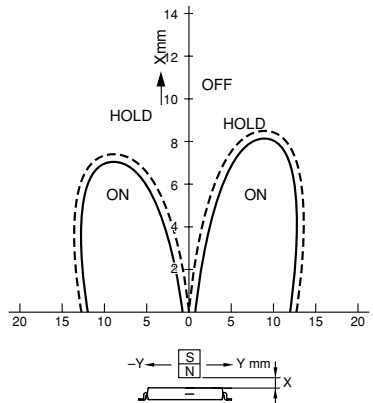
(1) X-Y characteristic H



(2) X-Z characteristic H



(3) X-Y characteristic V

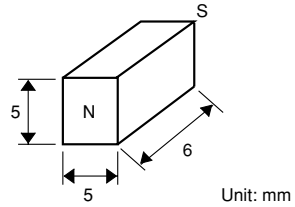


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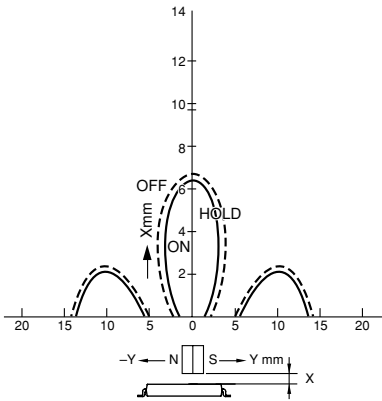
■ RA-903 Magnet drive characteristics example (2)

Magnet: 5 x 5 x 6 mm
 Anisotropic barium ferrite
 Surface magnetic flux 120 mT

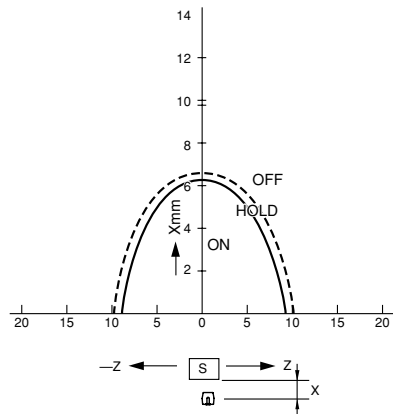
Molded switch: RA-901-1
 Pull-in value 27.9 (AT)
 Drop-out value 25.6 (AT)



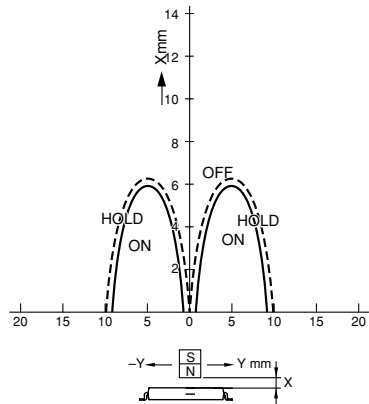
(1) X-Y characteristic H



(2) X-Z characteristic H



(3) X-Y characteristic V

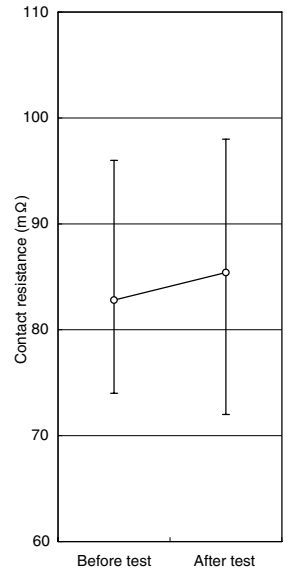
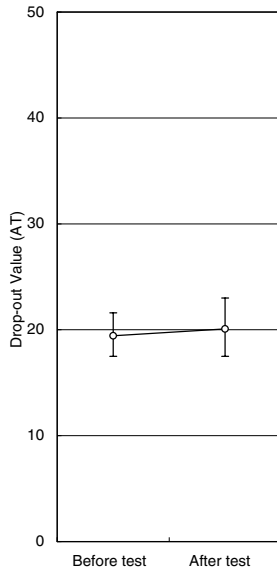
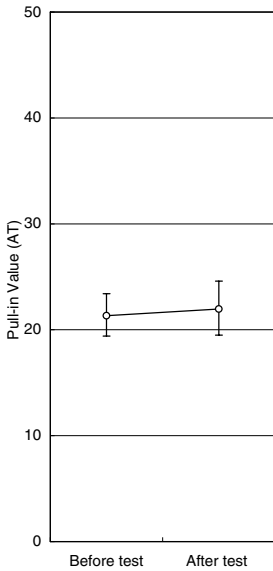


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■ ENVIRONMENTAL CHARACTERISTICS

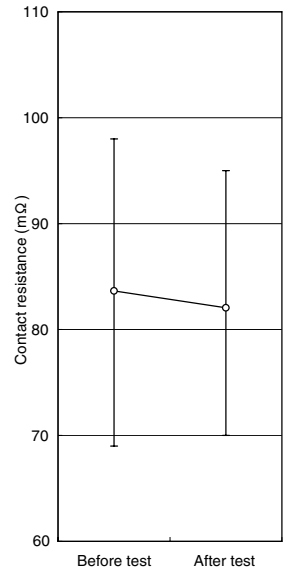
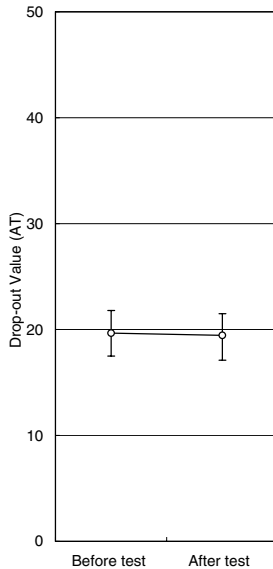
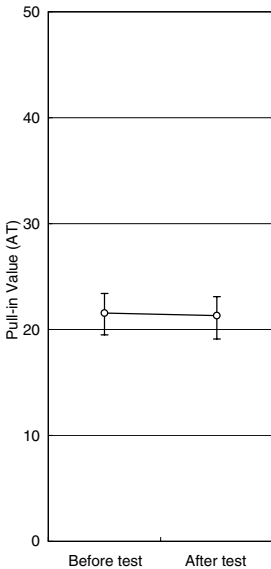
(1) Temperature cycle

(-55°C ~ +125°C)

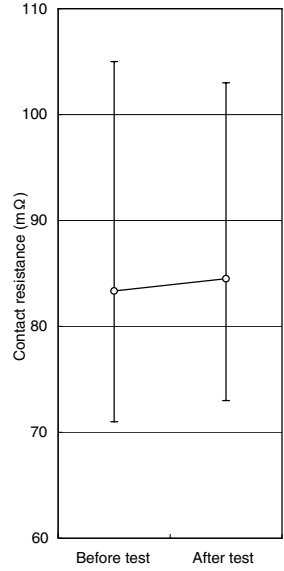
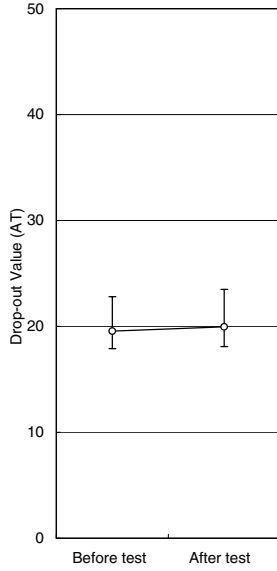
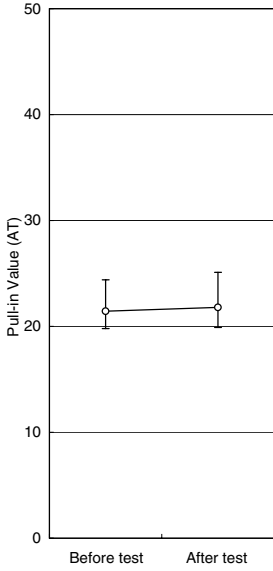


(2) Temperature and humidity cycle

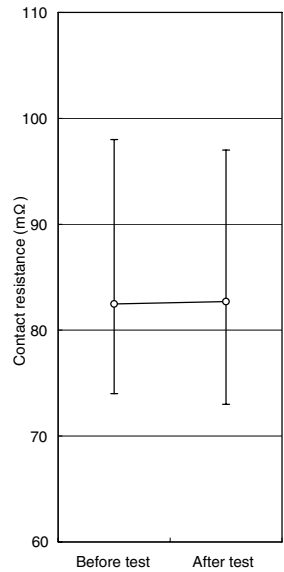
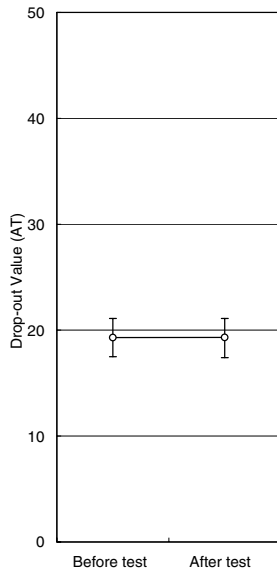
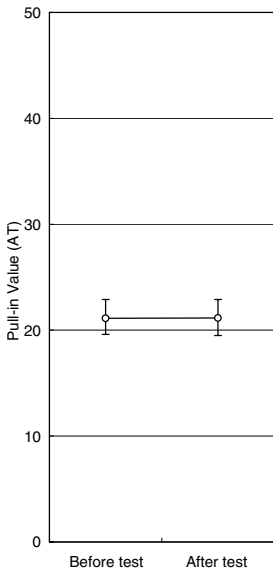
(-10°C ~ +65°C 80% ~ 98%)



(3) High temperature storage test (125°C 500H)

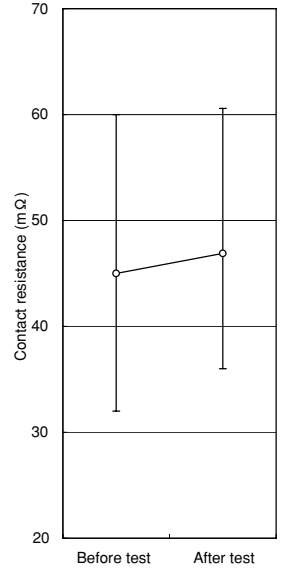
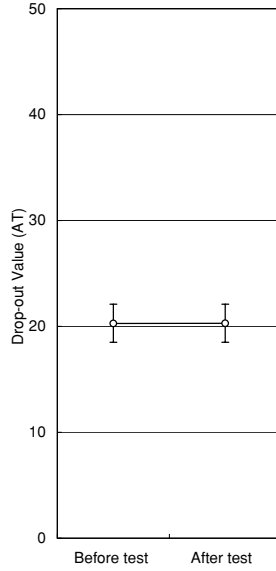
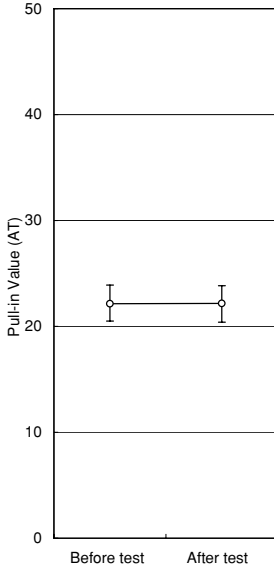


(4) Low temperature storage test (-40°C 500H)

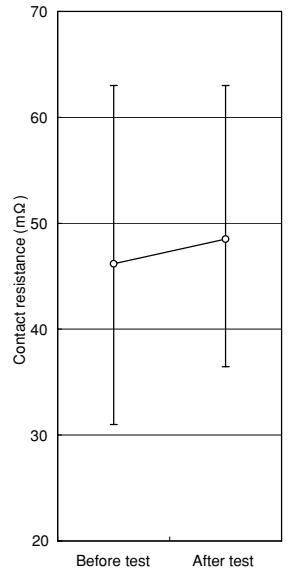
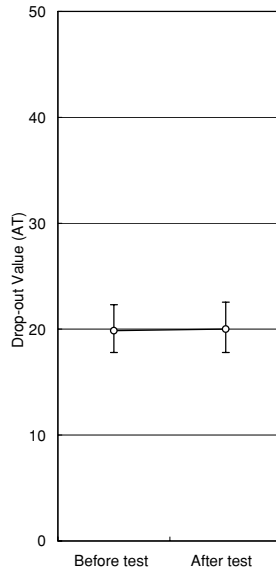
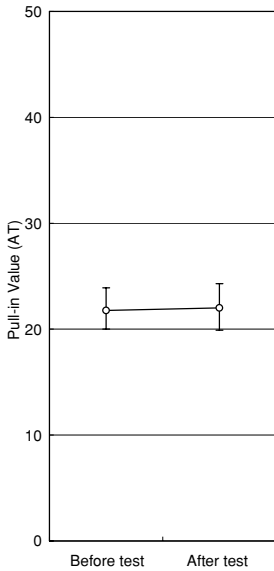


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(5) Shock test

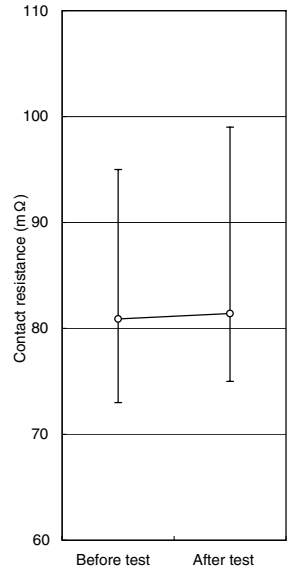
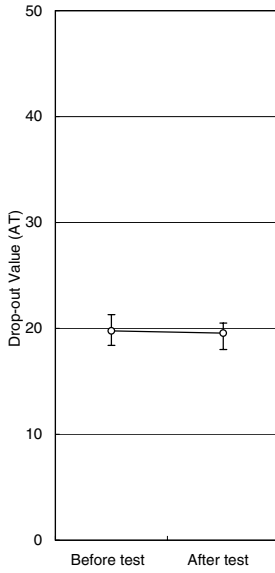
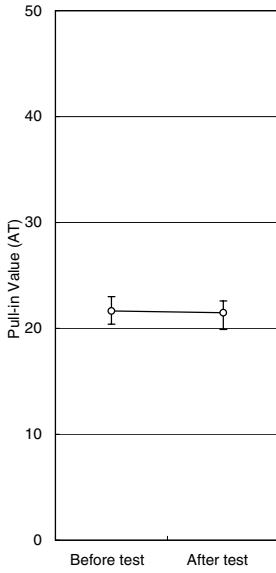
(490m/s² 11msec)

(6) Vibration test

(490m/s² 10~2000Hz)

(7) Shock Resistance test

(ϕ 10mm steel ball, free fall impact height 230mm)



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