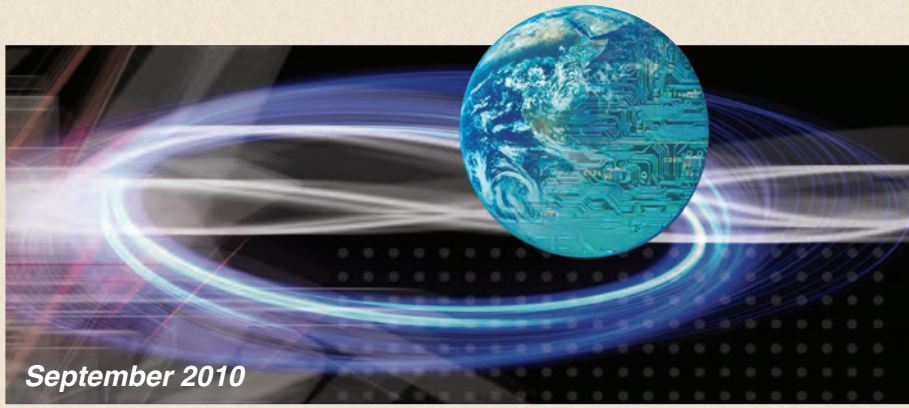
OKI Open up your dreams

Reed Switch Databook



OKI Sensor Device

OKI Sensor Device — Reed Switch Databook 2010 —

OKI

Oki Sensor Device Corporation

Tachihi Bldg. #7 4F, 6-1-1 Sakae-cho, Tachikawa-shi, Tokyo 190-0003, Japan
Tel: +81-42-537-6563 Fax: +81-42-537-6586
http://www.osdc.co.jp/

For further information please contact:

2010.9.500 OPS

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 applications 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 required and we hope it will stand you in good stead.

Utilizing state-of-the-art 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.

September 2010

Oki Sensor Device Corporation

NOTICE

1. The specifications described in this databook were established in line with standard operating and measurement conditions for product. Therefore, when actually using product, perform circuit/mounting design taking into account mechanical characteristics and environmental characteristics.
2. When implementing design, please use product within guaranteed range for electrical characteristics, environmental characteristics, operating characteristics and service life characteristics, etc. Please be aware that Oki Sensor Device Corporation (hereinafter, OSDC) bears no responsibility for results attributable to use outside of the guaranteed range, or other mistaken or improper use of product.
3. When using product, information, drawings and other material described in this databook, OSDC does not provide any guarantees, or grant any licenses relating to the industrial property rights, intellectual property rights or other rights of third parties. Please be aware that OSDC will bear no responsibility for infringement of the rights of third parties due to such use.
4. Although OSDC persistently strives to improve quality and reliability of product, a certain probability of occurrence of defect and malfunction is unavoidable. In order to avoid situations where defect or malfunction of product directly threatens human life, or causes injury or property damage, please conduct adequate safety design for overall equipment or system when designing equipment or system incorporating product. Strict caution is particularly necessary for use in applications such as traffic equipment, safety equipment, aviation/space equipment, nuclear power control, or medical equipment containing life support equipment.
5. The information contained in this databook can change without prior notice or warning owing to product and/or technical improvement. Before using product, please make sure that the information being referred to is up-to-date.
6. Reproduction or copying of content in this databook without prior authorization from OSDC is strictly prohibited.
7. Although the upmost care has been taken to ensure accuracy of information herein, please feel free to contact the Sales and Marketing Department if any errors are detected.

REED SWITCH
Data Book
2010

CONTENTS

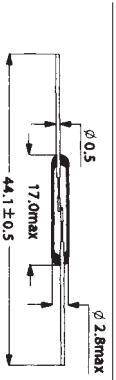
REED SWITCH

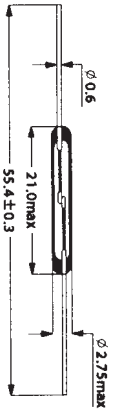
1 INTRODUCTION

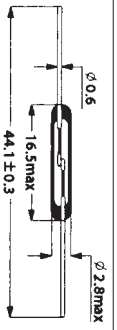
GENERAL DESCRIPTION, RELIABILITY, PRECAUTIONS, DESCRIPTION OF SYMBOLS AND TERMS

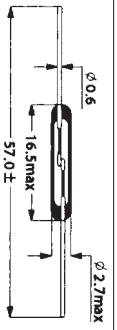
	Part No.	ORD213 RS	ORD311 RS	ORD211 RS	ORD219 RS	ORD312 RS	ORD221 RS	ORD2221 RS	ORD228VL RS	ORD324 RS	ORD324H RS
	Contact form	1A	1A	1A	1A	1A	1A (OFF SET)	1A (OFF SET)	1A	1A	1A
Electrical Characteristics	Pull-in [AT]	10 ~ 40	10 ~ 40	10 ~ 40	10 ~ 40	10 ~ 40	10 ~ 30	10 ~ 30	10 ~ 40	10 ~ 40	10 ~ 40
	Drop-out [AT]	5min	5min	5min	5min	5min	5min	5min	5min	4min	3min
	Contact resistance (Initial) [mΩ]	200max	200max	100max	100max	100max	100max	100max	100max	100max	100max
	Breakdown voltage [DCV]	150min	250min	150min	200min (PI ≧ 20)	250min	200min (PI ≧ 20)	200min (PI ≧ 20)	200min (PI ≧ 20)	250min	250min
	Insulation resistance [Ω]	10^9min	10^9min	10^9min	10^9min	10^9min	10^9min	10^9min	10^9min	10^9min	10^9min
	Electrostatic capacitance [pF]	0.4max	0.4max	0.2max	0.3max	0.3max	0.3max	0.3max	0.3max	0.3max	0.3max
	Contact rating [VA, W]	1.0	10	1.0	10	30	10	10	10	10	10
	Maximum switching voltage [V]	DC24/AC24	DC100/AC100	DC24/AC24	DC100/AC100	DC200/AC100	DC100/AC100	DC100/AC100	DC100/AC100	DC200/AC150	DC200/AC150
	Maximum switching current [A]	DC0.1	DC0.5	DC0.1	DC0.5	DC0.5	DC0.3	DC0.3	DC0.5	DC0.5	DC0.5
	Maximum carry current [A]	0.3	1.0	0.3	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Operating Characteristics	Operate time [ms]	0.3max	0.3max	0.3max	0.4max	0.4max	0.4max	1.0max	0.4max	0.4max	0.4max
	Bounce time [ms]	0.3max	0.3max	0.3max	0.3max	0.3max	0.5max	1.0max	0.3max	0.3max	0.3max
	Release time [ms]	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	13000 ± 2000	7500 ± 500	5900 ± 400	5900 ± 400	2750 ± 250	2750 ± 250	5000 ± 400	5000 ± 400	5000 ± 400
	Maximum operating frequency [Hz]	500	500	500	500	500	500	500	500	500	500
Standard Coil	Coil resistance [Ω]	600	600	450	450	450	450	450	450	450	450
	Number of turns [T]	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000
	Dimension [mm]	Φ 3.3 × 10	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
	Part No. [No.]	8	8	8	6	6	6	6	6	6	6
Operating Temperature Range		− 40℃ ~ + 125℃	− 40℃ ~ + 125℃	− 40℃ ~ + 125℃	− 40℃ ~ + 125℃	− 40℃ ~ + 125℃	− 40℃ ~ + 125℃	− 40℃ ~ + 125℃	− 40℃ ~ + 125℃	− 40℃ ~ + 125℃	− 40℃ ~ + 125℃
Features [Contact material]		Super ultra-miniature (Rh : Rhodium)	Super ultra-miniature long-life (Ir: Iridium)	Ultra-miniature (Rh)	Miniature high-performance (Rh)	High-power long-life (Ir)	Miniature offset-type (Rh)	Miniature Offset, Long Lead Type (Rh)	Miniature high-performance (Rh)	General purpose miniature-type (Rh)	General purpose miniature-type, long reed (Rh)
Page		39	47	55	63	71	79	87	95	103	111

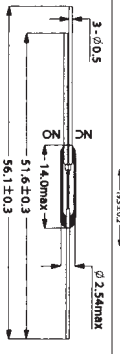
RS UL File # E70063

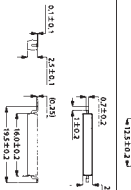


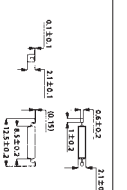












	Part No.	ORD325	ORD229	ORD2210	ORD2210V	ORD2211	ORD2211H	ORT551	RA-901	RA-903
Electrical Characteristics	Contact	1A	1A	1A	1A	1A	1A	1C	1A	1A
	Pull-in [AT]	10 ～ 40	20 ～ 60	15 ～ 60	20 ～ 60	20 ～ 40	20 ～ 40	10 ～ 30	15 ～ 49	16 ～ 46
	Drop-out [AT]	4min	6min	7min	7min	8min	8min	4min	10min	10min
	Contact resistance (Initial) [mΩ]	100max	100max	100max	100max	100max	100max	100max	100max	200max
	Breakdown voltage [DCV]	250min	600min（PI ≧ 35）	250min（PI ≧ 20）	1000min	200min	200min	200min（PI ≧ 20）	200min	150min
	Insulation resistance [Ω]	10^{10}min	10^{10}min	10^{10}min	10^{10}min	10^{9}min	10^{9}min	10^{9}min	10^{8}min	10^{9}min
	Electrostatic capacitance [pF]	0.3max	0.5max	0.5max	0.5max	0.3max	0.3max	1.5max	0.3max	0.4max
	Contact rating [VA, W]	10	DC50W/AC70VA	DC50W/AC70VA	100	50（12V-3.4W Lamp）	50（12V-3.4W Lamp）	3	10	1.0
	Maximum switching voltage [V]	DC200/AC150	DC350/AC300	DC200/AC150	DC350/AC300	DC100/AC100	DC100/AC100	DC30/AC30	DC100/AC100	DC24/AC24
	Maximum switching current [A]	DC0.5	DC0.7/AC0.5	DC1.0/AC0.7	DC1.0	0.5 In rush 3A	DC0.5	DC0.2	DC0.5	DC0.1
	Maximum carry current [A]	1.0	2.5	2.5	2.5	2.5	2.5	0.5	1.0	0.3
Operating Characteristics	Operate time [ms]	0.4max	0.6max	0.6max	0.6max	0.6max	0.6max	1.0max	0.4max	0.3max
	Bounce time [ms]	0.4max	0.5max	0.5max	0.5max	0.4max	0.4max	NOI.0max、NC1.5max	0.3max	0.3max
	Release time [ms]	0.05max	0.05max	0.05max	0.05max	0.05max	0.05max	0.5max	0.05max	0.05max
	Resonant frequency [Hz]	3700 ± 300	2500 ± 250	2500 ± 250	2500 ± 250	4600 ± 400	4600 ± 400	6000 ± 4000	5400typ	13000typ
	Maximum operating frequency [Hz]	500	500	500	500	500	500	200	500	500
Standard Coil	Coil resistance [Ω]	450	500	500	500	450	450	550	530	930
	Number of turns [T]	5000	5000	5000	5000	5000	5000	5000	5000	5000
	Dimension [mm]	Φ 3.7 × 15	Φ 4.6 × 21	Φ 4.6 × 21	Φ 4.6 × 21	Φ 3.7 × 15	Φ 3.7 × 15	Φ 4.6 × 10	Φ 5.0 × 12	Φ 4.4 × 5
	Part No. [No.]	6	3	3	3	6	6	10	901	903
Operating Temperature Range		− 40℃ ～+ 125℃	− 40℃ ～+ 125℃	− 40℃ ～+ 125℃	− 40℃ ～+ 125℃	− 40℃ ～+ 125℃	− 40℃ ～+ 125℃	− 40℃ ～+ 125℃	− 40℃ ～+ 125℃	− 40℃ ～+ 125℃
Features [Contact material]		General purpose miniature-type (Rh)	High breakdown Voltage (Rh)	High power (Rh)	Vacuum High power (Rh)	Lamp load (Rh)	Lamp Load, Long Lead Type (Rh)	Ultraminiature transfer (Rh)	Miniature SMD (Rh)	Ultra-miniature SMD (Rh)
Page		119	127	135	143	151	159	167	175	183

UL File # E70063

Environmental Characteristics

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

	Characteristics (common to all types)	Test Conditions	Remarks
Shock	Will operate normally with shock of up to 294m/s^2 (11 msec)	MIL-STD-202G METHOD 213B-J	1
Vibration	Will operate normally with vibration of up to 196m/s^2 (10-2000Hz)	MIL-STD-202G METHOD 204D-D	2
Temperature range	Will operate normally between temperatures of -40 ℃ ~ +125℃	–	3
Lead tensile strength	Will withstand 22.2N static load	MIL-STD-202G METHOD 211A	4

Remark 1. If shock in excess of 294m/s^2 is applied to a reed switch the pull-in value is subject to change from standard specifications.

2. Due to resonant frequency a reed switch may not operate properly if vibration is applied in excess of 2KHz (even minute acceleration).

3. Although a reed switch can operate beyond its specified range, mounting conditions need to be verified. Demagnetization may also occur due to temperature characteristics of permanent magnets (even at lower temperature ranges).

4. ORD213 and ORD311 will withstand a tensile static load of 14.7 N.

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, reed switch improvements were made in parallel with the development of the telecommunications technology. At the same time, the advantages of reed switches such as 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.

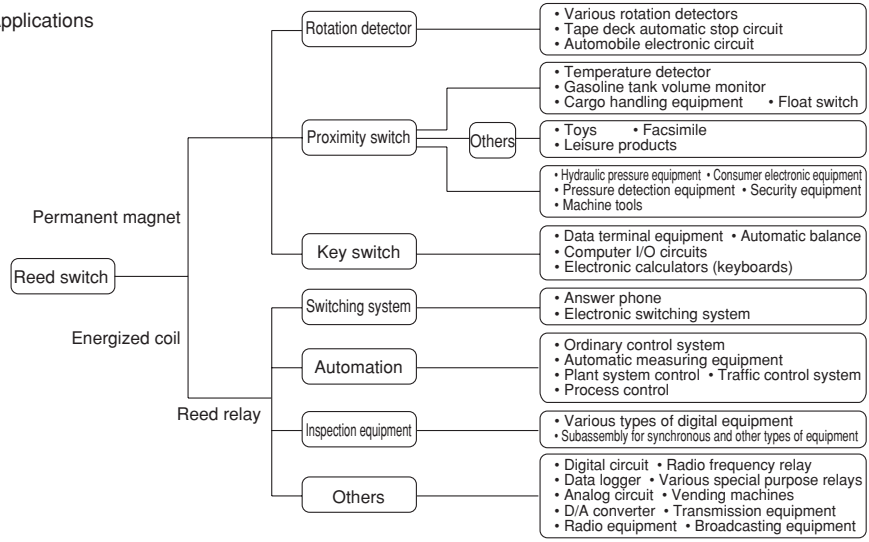
Boasting extreme superior quality, our reed switches are manufactured by adopting our very own surface deactivation technology, high performance automatic sealing machines, and contact resistance technology employing our reputed magnetic flux scanning method. In particular, our pivotal surface deactivation technology suppresses the problematic issue of increased contact resistance caused by organic contamination common in conventional rhodium plated reed switches. Owing to this breakthrough, it is now possible to produce a reed switch with stabilized contact resistance. In fact, we received the prestigious Schneider Award at the 21st Annual National Relay Conference for this technology in 1973. Thereafter, we were awarded the Schneider Award at the 36th and 38th conference for our research into reed switch contact phenomena.

1. Reed Switch Characteristics

Reed switches display the following characteristics.

(1) Hermetically sealed within a glass tube with inert gas, reeds contacts are not influenced by the external atmospheric environment.
(2) Quick response because of small mass of moving parts
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) 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, reed switches comprise of 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, reed switches are 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

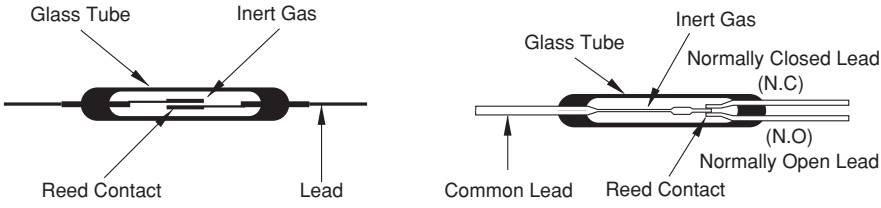
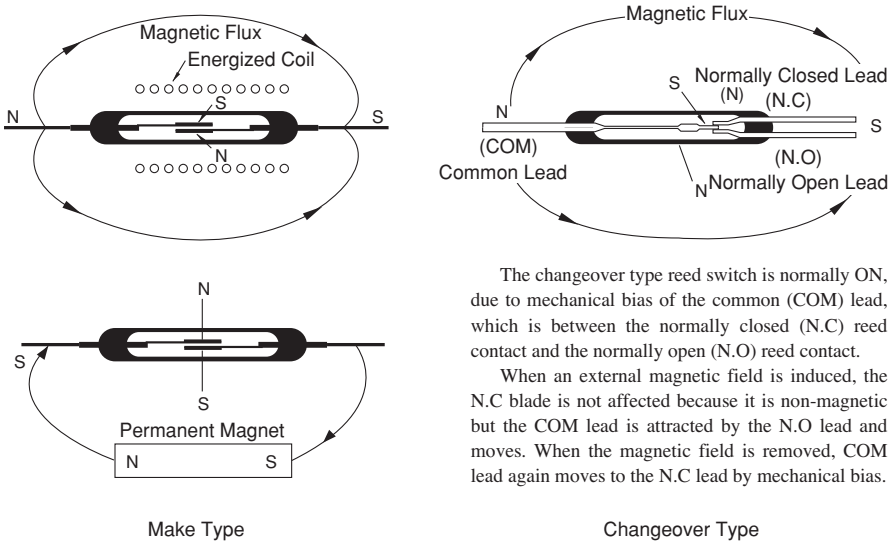


Figure 3.1

Reed Switch Operating Principles



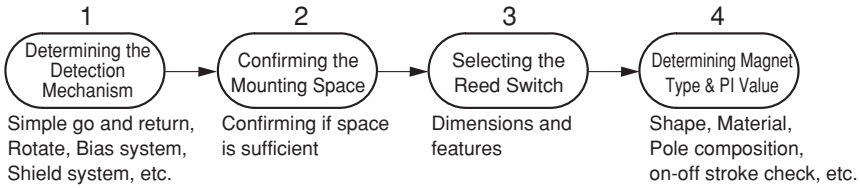
The changeover type reed switch is normally ON, due to mechanical bias of the common (COM) lead, which is between the normally closed (N.C) reed contact and the normally open (N.O) reed contact.

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.

Figure 3.2

4. Permanent Magnet Drive

When a permanent magnet is to be used for driving a reed switch, the following steps are generally taken to select the type of magnet to be used and determining the relative distance of it to the reed switch.



4-1 Permanent Magnet Drive Method

The following examples show the four basic patterns to drive a reed switch with a permanent magnet.

1) Go and Return Method

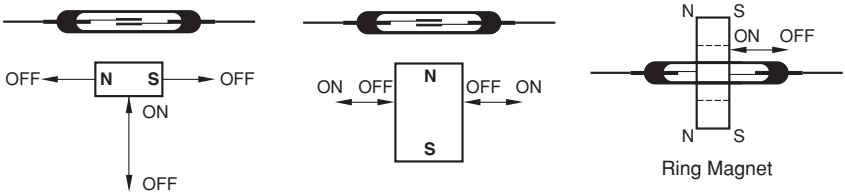


Figure 4.1

2) Rotating Method

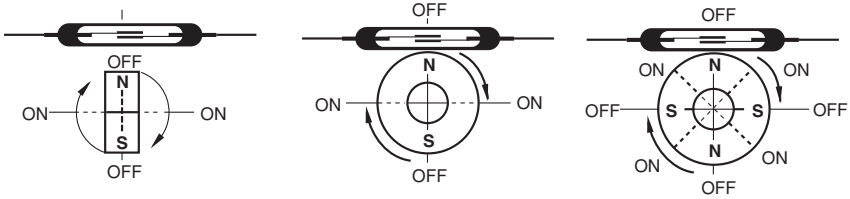


Figure 4.2

3) Bias Method

4) Shielding Method

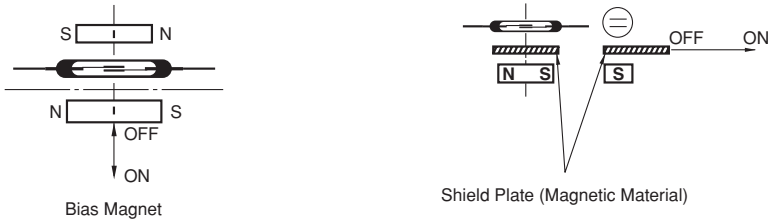


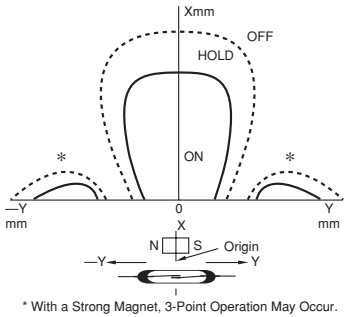
Figure 4.3

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)



* With a Strong Magnet, 3-Point Operation May Occur.

Figure 4.4

(2) X-Z Characteristic H (Horizontal)

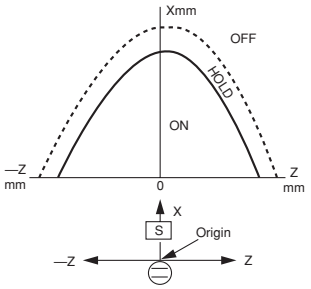


Figure 4.5

(3) X-Y Characteristic V (Vertical)

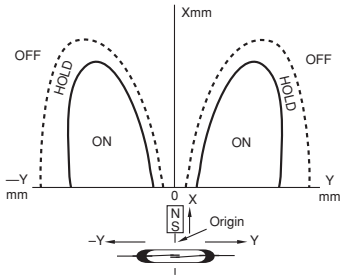
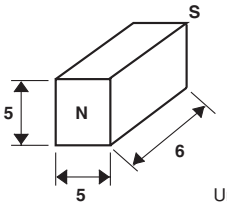


Figure 4.6

4-3 ORD228VL Magnet Drive Characteristics Example

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



Unit: mm

(1) X-Y Characteristics H

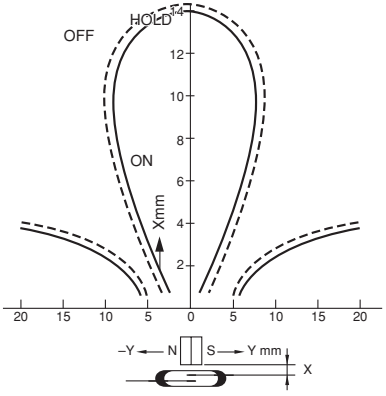


Figure 4.7

(2) X-Z Characteristics H

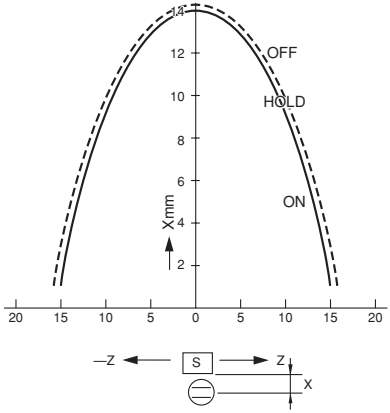


Figure 4.8

(4) X-Y Characteristics V

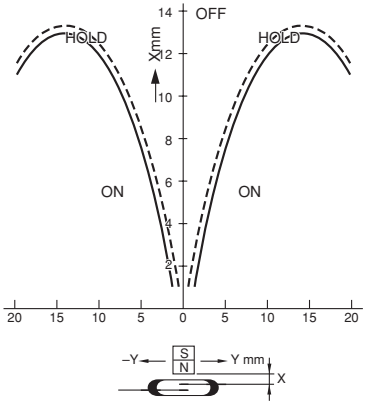
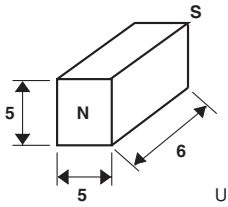


Figure 4.9

4-3 ORD228VL Magnet Drive Characteristics Example

Magnet: 5×5×6mm
Anisotropic barium ferrite
Surface magnetic flux120 mT
Reed switch: ORD228VL: Pull-in Value 20.0 (AT)
Drop-out Value 15.7 (AT)



Unit: mm

(1) X-Y Characteristics H

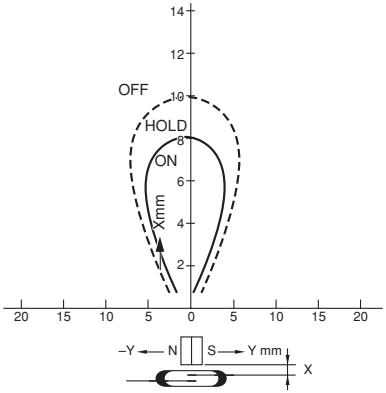


Figure 4.10

(2) X-Z Characteristics H

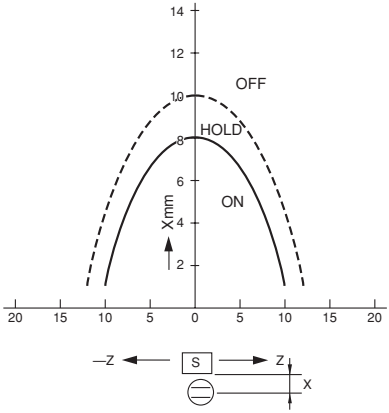


Figure 4.11

(4) X-Y Characteristics V

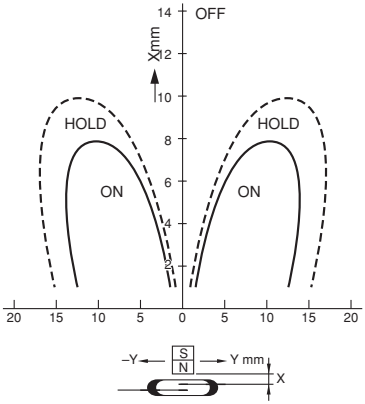


Figure 4.12

REED SWITCH RELIABILITY

Introduction

In recent years, both the demand and application of the humble reed switch have continued to rapidly expand along with rapid developments in electronics and mechatronics. Some of the more prominent applications include automobile, communications, office automation, control, and customer electronics. In this fast-paced, all-crucial environment, a failure, for example, could have immeasurable consequences. With this in mind, we believe it is the obligation of the manufacture to ensure a steady supply of reliable, high quality products.

Based on this recognition, we have adopted the following comprehensive quality assurance system based on ISO9001 with integrated product policy in development, manufacturing, marketing and sales, which allows us to supply products with consistent and reliable quality.

We are committed to further expand our efforts to meet the ever-increasing demands for improvements in the performance and reliability of our products.

Below is an outline of our quality assurance system and its underlying concepts. Here, we will briefly explain our reliability testing methods and unique technologies which enable us to maintain high reliability in our reed switches.

1. Quality Assurance System and Underlying Concepts

The quality policy pursued by our company is as follows:

Based on the trust and sympathy from our clients across the world, we will continuously improve our management system to ensure:

- Stable supply of products
- Reliable and high quality products
- Products that offer value to our customers

Our product quality assurance process can be broadly divided into four stages consisting of the product planning stage, development and prototype production stage, trial mass production stage, and mass production stage. The entire process is illustrated in the flow chart shown in Figure 1.1, and we will explain each stage in sequential order.

1-1 Product planning stage

To manufacture products that meet market demand and satisfy customer needs, we carefully study functional and failure rate requirements, product applications, environment 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, process capacity requirement plan, and level adjustment 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. We also manufacture actual prototypes, on which testing is carried out to ensure reliability. Since most product quality is determined at the design stage, we, from the perspective of building quality into product design, pay particular attention to quality confirmation at this stage.

Specifically,

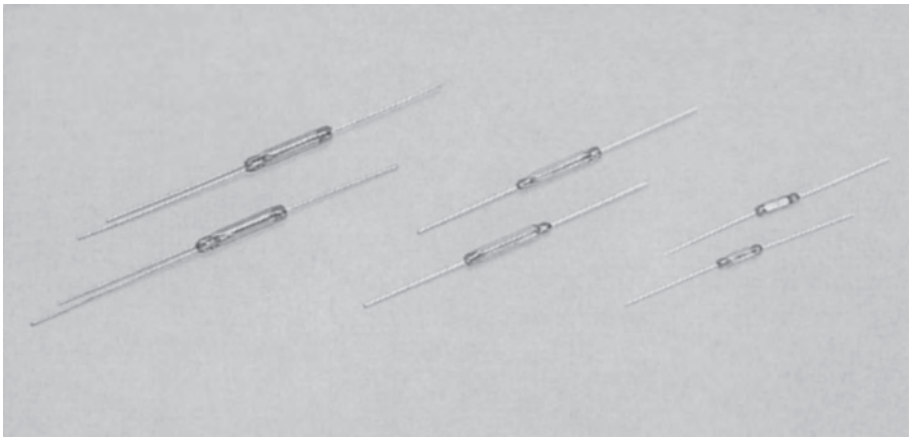
1) After completing basic design, our design engineering, production engineering and product reliability departments perform design reviews.
2) Prototypes are subjected to repeated characteristics and reliability evaluation. At this point, characteristics and reliability are confirmed while the stability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

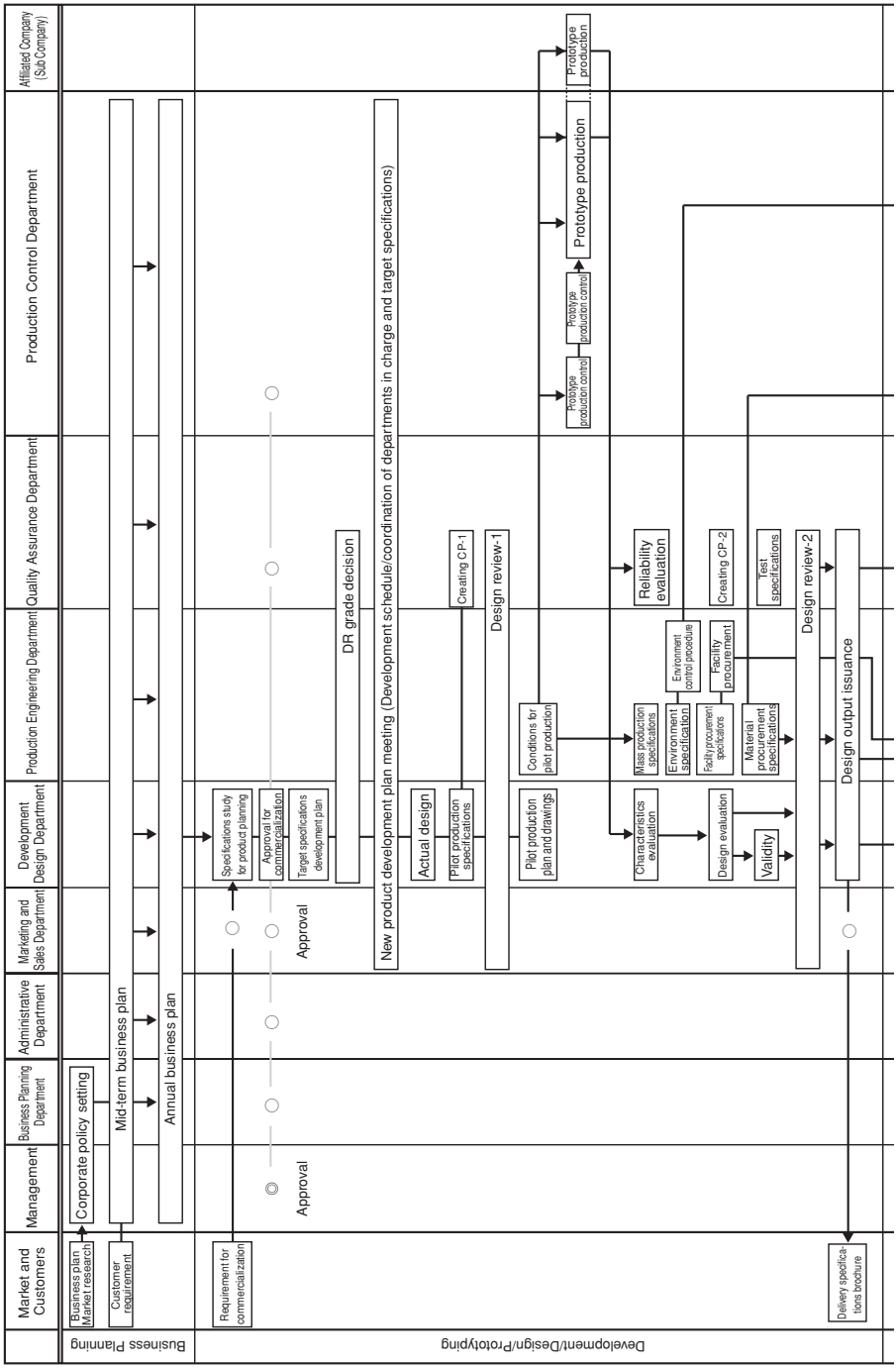
1-3 Trial mass production stage

Here, similar to that above, various tests are performed on mass production prototypes to check the characteristics and reliability of products at factory level. After confirming that the product quality is satisfactory, we start mass production after conducting mass production preparation reviews.

1-4 Mass production stage

At this stage, careful management of purchased materials and parts, management of product quality during the manufacturing process, management of our facilities and measuring equipment as well as careful management of manufacturing conditions and the environment is implemented to ensure that product quality stipulated during the designing stage is achieved and maintained. The general description of our in-process quality control and assurance is shown in Figure 1.2.




Market and Customers
Management
Business Planning Department
Administrative Department
Marketing and Sales Department
Development Design Department
Production Engineering Department
Quality Assurance Department
Production Control Department
Affiliated Company (Sub Company)
Business Planning
Development/Design/Prototyping
Business plan Market research
Customer requirement
Corporate policy setting
Mid-term business plan
Annual business plan
Approval
Requirement for commercialization
Specifications study for product planning
Approval for commercialization
Target specifications development plan
Approval
DR grade decision
New product development plan meeting (Development schedule/coordination of departments in charge and target specifications)
Actual design
Pilot production specifications
Creating CP-1
Design review-1
Pilot production plan and drawings
Conditions for pilot production
Prototype production control
Prototype production control
Prototype production
Prototype production
Characteristics evaluation
Mass production specifications
Environment specification
Environment control procedure
Facility procurement specifications
Facility procurement
Reliability evaluation
Design evaluation
Validity
Material procurement specifications
Creating CP-2
Test specifications
Design review-2
Design output issuance
Delivery specifications brochure

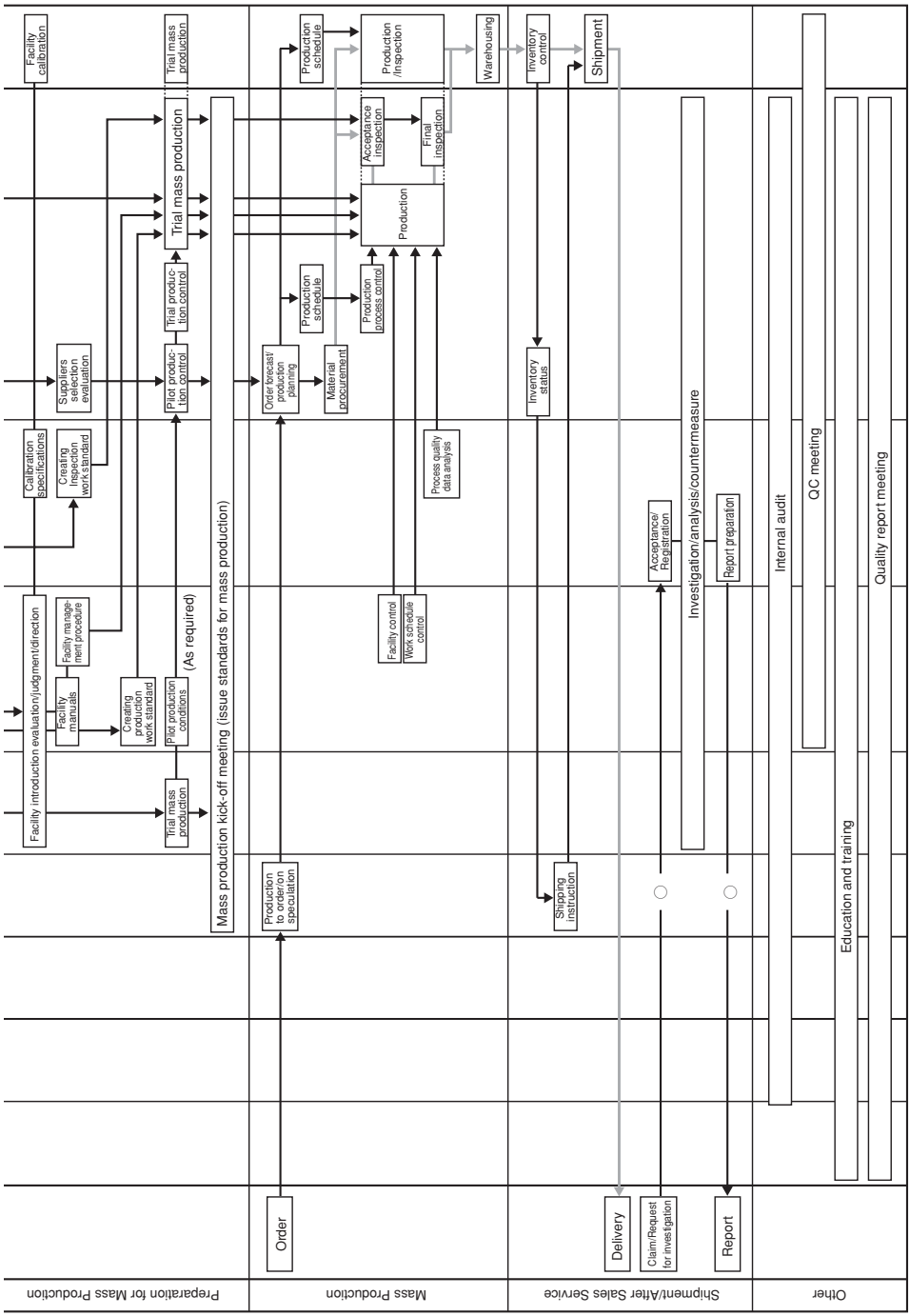


Figure 1.1 Quality assurance system

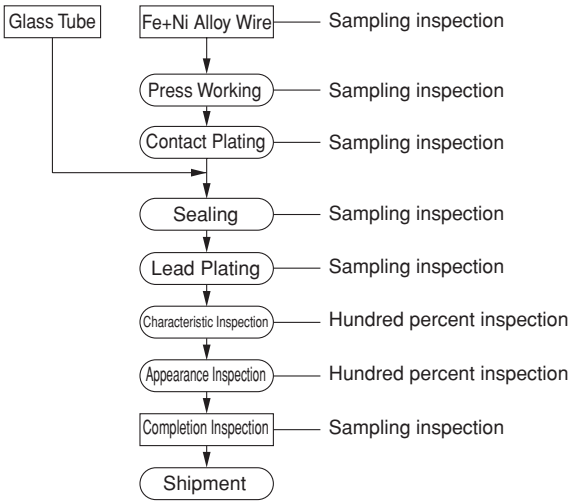


Figure 1.2 Quality Control Flow Chart

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.

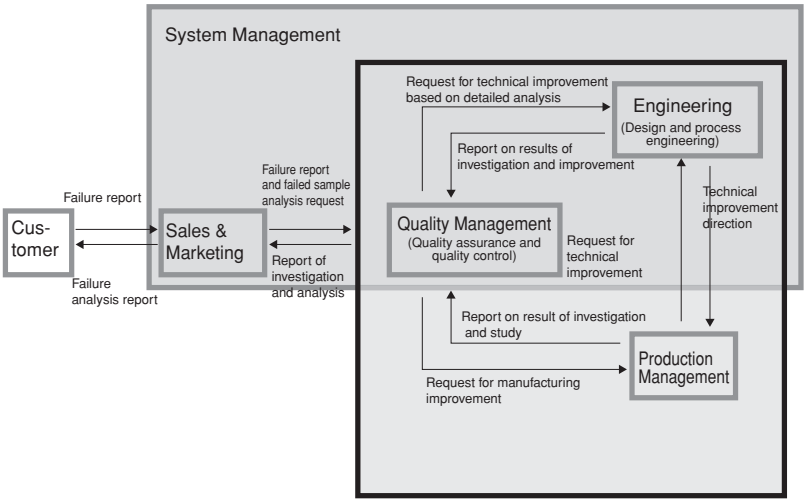


Figure 1.3 Failure Report Process Flow Chart

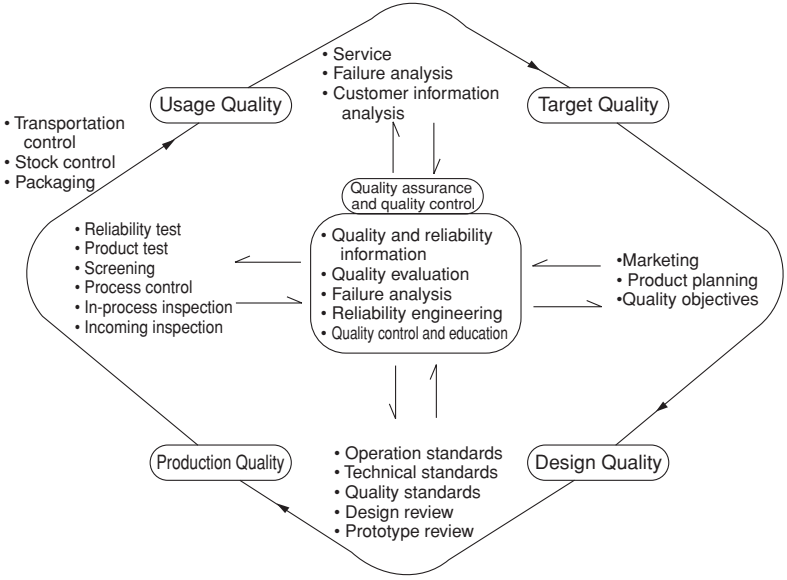


Figure 1.4 Quality Assurance and Quality Control Flow

2. Our Original Technology Supports High Reliability

2-1 High-reliability contact materials

Our reed switches traditionally use rhodium as their contact material, and are highly rated by our customers for their extremely high reliability.

Rhodium is a metal that belongs to the platinum group and has superior properties such as its extreme hardness, which is effective in preventing sticking, and its high melting point which gives it the ability to significantly reduce contact surface wear caused by joule heart and arc discharge. We have been employing rhodium as the contact material after overcoming its unfavorable property of absorbing organic impurities, by developing and applying our own original technology.*1

*1 Contact surface deactivation treatment (awarded Schneider Award)

Nevertheless, with the recent changes in the environment, there have been calls for even higher functionality and reliability in reed switches. We have been collaborating with material manufacturers in response to these demands, and have developed reed switches with iridium contacts, for which mass production technologies had previously been difficult to establish. We have manufactured several variations of reed switch products with iridium contacts, with more to be released at future dates.

While iridium is part of the platinum family as is rhodium, iridium has higher hardness and higher melting point than rhodium. These properties make it possible for reed switches with iridium contacts to achieve higher functionality, higher reliability and longer operating life than reed switches with rhodium contacts, even when both types of reed switches have the same shape.

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 that demands stringent quality control and management. At the time of sealing, working temperature reaches about 1000 degrees C, which induces any impurities on the glass tube to evaporate but causes contamination on the reed switch contacts. To prevent the effects of these phenomena, we have developed strict standards for the selection of glass material and use our own unique and superior technology for automatic sealing. Such improvements in the manufacturing processes 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 stringent 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 have 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 a multilayered coil causes the magnetic foreign particles to move to the contact part of the reed switch. Foreign particles are detected by measuring changes in the contact resistance.

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

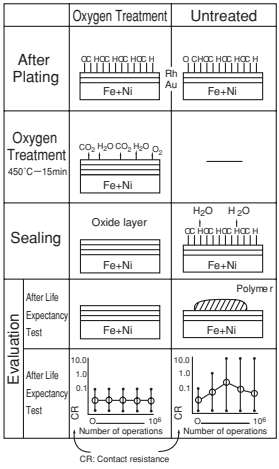


Figure 2.1

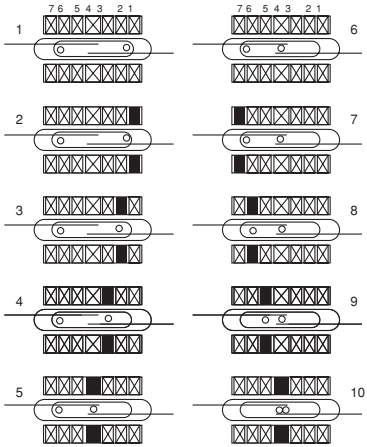


Figure 2.2 Magnetic Flux Scanning Test (FS Test)

3. Reliability Testing Methods

Parameter	Specifications	Unit	Test method
Temperature and humidity cycle	−10～+65 (80～98)	℃ (%)	MIL-STD-202G 106E (Refer to Figure 2.3)
Temperature cycle	−55～+125	℃	Chart is shown in Figure 2.4.
High temperature storage test	125	℃	500H
Low temperature storage test	−40	℃	500H
Shock Resistance	30G (11 msec)	G	MIL-STD-202G 213B Condition J
Vibration Resistance	20G (10-2000Hz)	G	MIL-STD-202G 204D Condition D

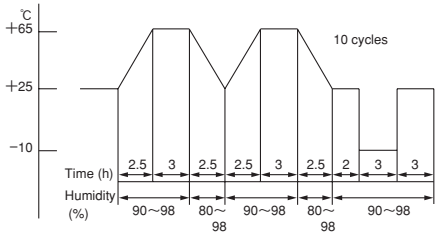


Figure 2.3 Temperature and Humidity Cycle Chart

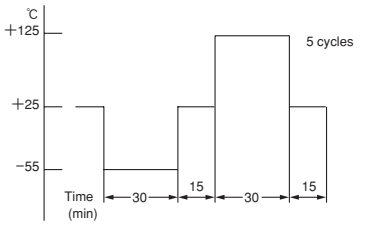


Figure 2.4 Temperature Cycle Chart

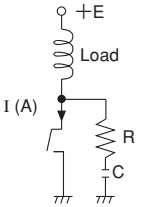
PRECAUTIONS AND APPLICATIONS

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

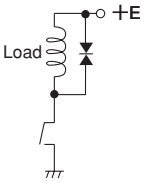
In case an electromagnetic relay, electromagnetic solenoid, or electromagnetic counter which has inductance component is provided as a load in a circuit, the energy stored in the inductance will cause an inverse voltage when the reed contacts break. The voltage, although dependent on the inductance value, sometimes reaches as high as several hundred volts and becomes a major factor in deteriorating the contacts. In order to prevent this many protection circuits are provided, typical examples of which are shown in Figure 1.1.



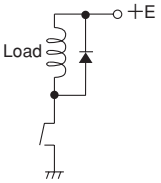
a) Contact Protection by Capacitor and Resistance (Also possible at the load terminal.)

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

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



b) Contact Protection by Varistor
When the contact open time is long, varistor should be put into the load terminal.



c) Contact Crotection by Diode
Breakdown voltage of diode should be larger than E volt.

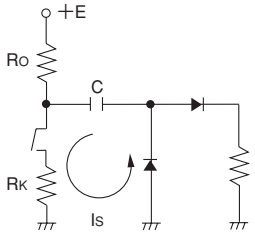
Forward current of diode should be almost equal to 5E/coil resistance.

Figure 1.1

1-2 Capacitive loads

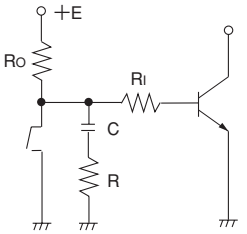
Significant deterioration of reed contacts is incurred when a capacitor is provided in series or in parallel with the reed switch contacts in a closed circuit due to rush current flowing at charge and discharge of capacitance.

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



a) Current limiting resistance (RK) is installed in the circuit to protect contacts.

$$Is = \frac{\text{Voltage stored across C}}{RK} < 0.1\ (A)$$



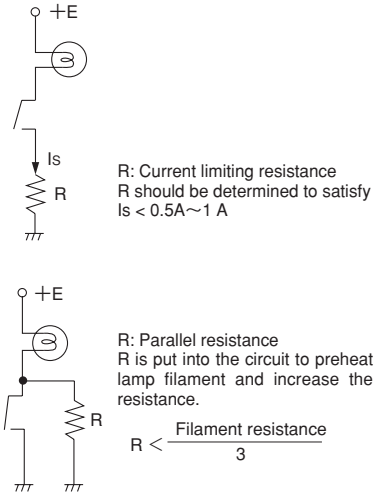
d) Resistance (R) is installed in the circuit to protect contacts. R should be between 50 and 500 Ω

Figure 1.2

1-3 Lamp load

In general, tungsten lamps are used and these lamps display low resistance right before lighting up and high resistance as they begin to light up. They exhibit a steady current and when operating a reed switch under these conditions the contacts are prone to sticking because rush current (approximately 5-10 times larger) will run directly after the lamp initiates. As such, it is crucial to incorporate a contact protection circuit in circuits with lamp loads as the amount of current that runs through the circuit is reflective of that flowing to charge a capacitor.

Fig. 1.3 shows examples of protection circuits.

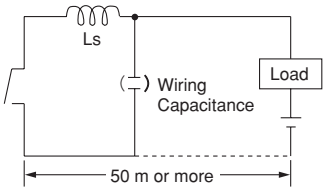


If no resistance is to be put into the circuit, use ORD2211.

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 LS should be used. Ls value differs according to the load current but should be in the range of 0.5 to 5 mH.



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 move.

(2) When cutting or bending the leads, be sure to protect the sealing portions. As shown in Figure 2.1, the lead should be firmly secured by a jig.

(3) After the process, confirm that there is no crack or chipping in the glass tube.

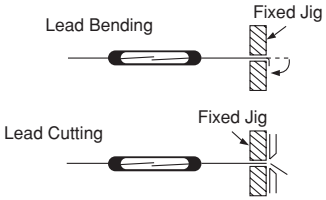


Figure 2. 1

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 shape of the 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 may become more sensitive to a magnet than it was initially.

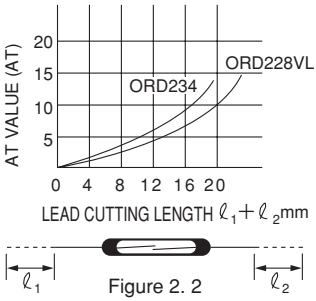


Figure 2. 2

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 a jig similar to the one used for a reed switch with cut leads. 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 ℃). When soldering, keep the soldering point at least 1 mm away from the edge of the glass. 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 edge of the glass. When using a large power supply for welding, heat generated in the leads 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. This may induce welding current to the reed switch and effectively melt the contacts together. Precautions are necessary.

3-3 Ultrasonic welding

It is important to take extra care when using ultrasonic welding on a reed switch or using an ultrasonic welder in the vicinity of a reed switch as it can alter the contact gap and characteristics of a reed switch.

3-4 Mounting on a printed circuit board

When installing on a printed circuit board, either elevate the reed switch above the board or drill holes in the board to ensure that the glass tube does not come into contact with the board (Fig. 3.1). Other methods can cause damage to the glass tube by way of mechanical influence or other adverse elements applied externally.

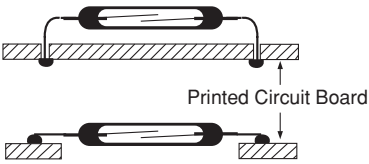


Figure 3.1

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 294m/s^2, the pull-in value may change.

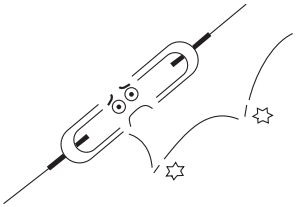


Figure 3.2

6. Relation to Characteristic Values Given by Other Makers

Measurement methods are manufacturer 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 values (four digit numbers) indicated on packaging refers to the range values determined at the time of product sorting. The guaranteed pull-in values have a tolerance of ±2AT on these range values. For example, the guaranteed pull-in value of ORD211 2025AT is 18 to 27AT.

8. Reed Switch Life Characteristics

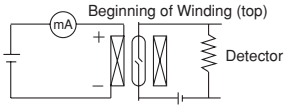
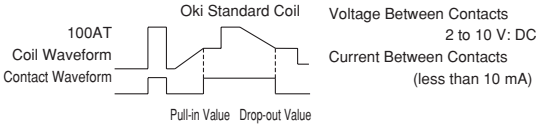
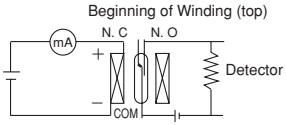
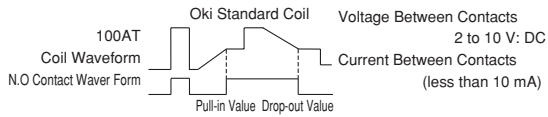
The life test data provided in this document is an example of test results when a reed switch is actuated by a coil (100 AT square wave excitation). When a reed switch is actuated by a permanent magnet, the life characteristics of the reed switch may vary depending on the transfer rate and distance of the permanent magnet.

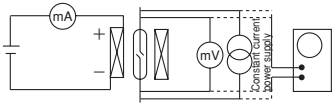
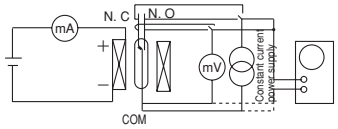
9. Specifications

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

Following are some commonly used terms for the fundamental operating characteristics of a reed switch.

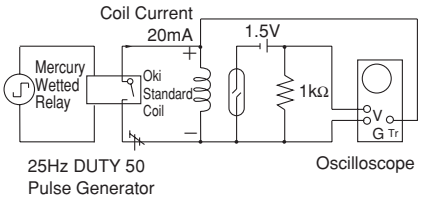
Term	Symbol	Unit	Description and Test Methods
Pull-in Value	PI	AT	• This is the most important operating characteristic of a reeds switch. Pull-in is the product of the current value necessary to operate the coil multiplied by the number of coil windings. This is the sensitivity of a reed switch. High sensitivity means low pull-in value.
Drop-out Value	DO	AT	• 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 **Make Type**  End of Winding (Bottom) Coil Saturation Current 20mA (SOAK) 100AT  Current at time of operation x number of turns in standard coil (5000T): Indicated in AT **Change Over Type**  End of Winding (Bottom) Coil Saturation Current 20mA (SOAK) 100AT  Current at time of operation x number of turns in standard coil (5000T): Indicated in AT

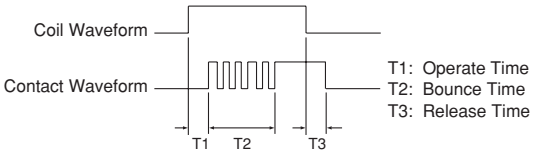
Term	Symbol	Unit	Description and Test Methods
			Note: Measure after making sure that the center of the coil and the center of the reed switch contacts are aligned. Initially, apply soak current (100 AT) then return to zero (AT). Next, apply the current in the same direction and measure it. The polarity of the current applied to the coil should be adjusted so that the magnetic field runs in the same direction as terrestrial magnetism. (The leading end of the coil-wire at the top should have positive polarity.)
Contact Resistance	CR	mΩ	• Contact resistance is the resistance between contacts when the contacts are closed and includes conductor resistance. • Test method (2) Measurement circuit of contact resistance **Make Type**  Oki Standard Coil Microohmmeter (YHP-4328A or equivalent) {Applied voltage for measurement (less than 10V DC) / Current for measurement (less than 10 mA)} or Microohmmeter Coil current 20 mA (100AT) **Change Over Type**  Oki Standard Coil Microohmmeter (YHP-4328A or equivalent) {Applied voltage for measurement (less than 10V DC) / Current for measurement (less than 10 mA)} or Microohmmeter Coil current 20 mA (100AT) N.O 0 mA (0AT) N.C
Breakdown voltage		V	• This value indicates the resistance voltage of the contacts. Breakdown voltage specifies the level of temporary overvoltage that a switch can withstand during a power surge or other similar phenomena generated externally or in the circuit.

Term	Symbol	Unit	Description and Test Methods
			• 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 20AT or more. The criterion of leak current is less than 0.1mA for one minute.
Insulation Resistance		V	• 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 insulation resistance tester at 100V DC.)
Electrostatic Capacitance		pF	• Electrostatic capacitance is the value of capacitance between open contacts. The overlap of a reed switch is fixed to determine electrical performance. The wider the contact gap the lower the electrostatic capacitance. Electrostatic capacitance is measured at 1MHz-0.1V.
Contact Rating		W VA	• Contact rating is the maximum product of voltage and current and is a very important value when determining contact switching performance. In order to anticipate constant life expectancy and assure reliability when switching is performed, the contact rating must not be exceeded and must be 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	• Maximum switching voltage is the maximum voltage at which contacts can be switched and is a reference voltage for determining 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	• Maximum switching current is the maximum current at which contacts can be switched and is a reference voltage for determining 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	• 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.

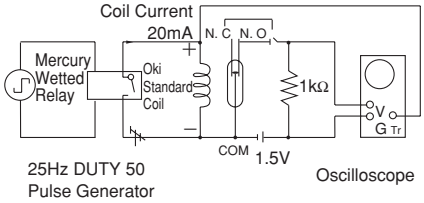
Term	Symbol	Unit	Description and Test Methods
Operate Time	Top	ms	• Operate time refers to the time required for the contacts to close after applying voltage to the coil. Unless otherwise specified, operate time does not include bounce time.
Bounce Time	Tb	ms	• Bounce time refers to the time between the contacts closing initially and the time they completely close.
Release Time	Trls	ms (μs)	• Release time refers to the time taken for the contacts to return to their normal position after the voltage applied to the coil is removed.
			• Test method (3) Time characteristics measurement circuit

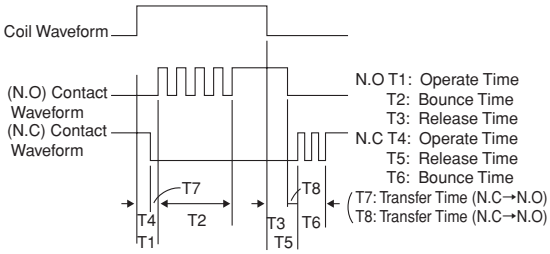
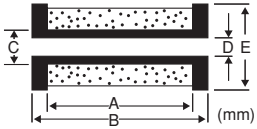
Make Type





Change Over Type



Term	Symbol	Unit	Description and Test Method
			 Note: Measure after making sure that the center of the coil and the center of the reed switch contacts are aligned.
Resonant Frequency		Hz	• Resonant frequency is the vibration frequency inherent to the reed switch. Misoperation may occur if the reed switch is subjected to vibrations which have a similar frequency to the resonant frequency.
Maximum Operating Frequency		Hz	• Maximum operating frequency is the maximum drive frequency. This value indicates the maximum operating frequency for opening and closing the reed switch. If this value is exceeded, abnormal switching may occur due to the relationship with operate time and bounce time.
Standard Coil		Num-ber	• The standard coil is the coil provided for measuring reed switch characteristics. The standard coil varies depending on the type of the reed switch. Standard Coil Specifications 

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 Reed Switch	ORD229 ORD2210 ORD2210V	ORD219 ORD221 ORD228VL ORD2211 ORD2221 ORD312 ORD2211H ORD324 ORD324H ORD325	ORD211 ORD213 ORD311	ORT551	RA-901	RA-903

2

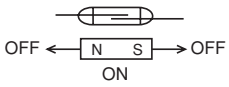
Application Notes

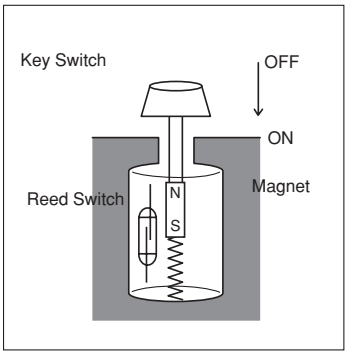
◇ APPLICATION NOTES

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

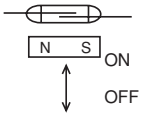
Reciprocating Operation

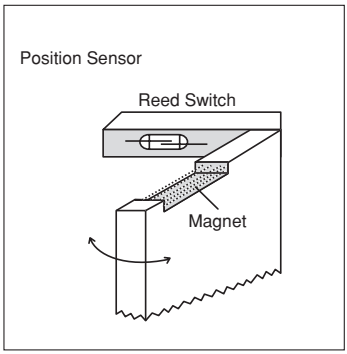




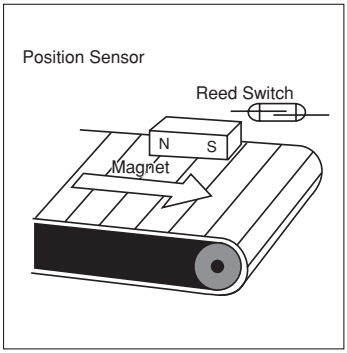
Application Examples:
Various types of button switches
(keyboards, etc.)

Reciprocating Operation

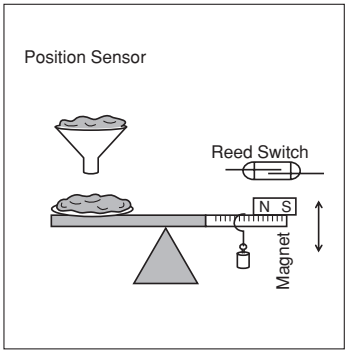




Application Examples:
Various types of door sensors
(security systems, etc.)



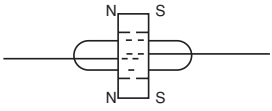
Application Examples:
Various types of position sensors
(conveyor control, etc.)



Application Examples: Automatic balance

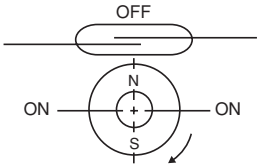
Reed Switch Application Examples-II

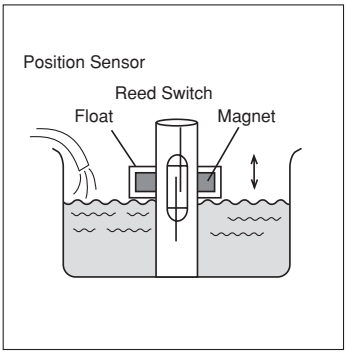
Position Sensor



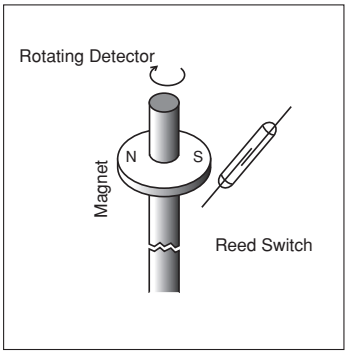
OFF—ON—OFF

Rotating Operation

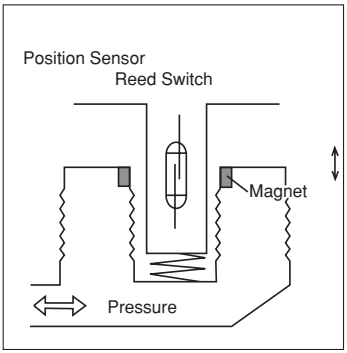




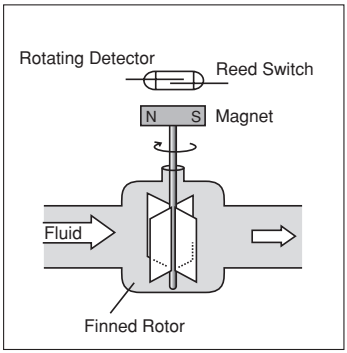
Application Examples: Liquid level sensor, various float switches



Application Examples:
Various types of rotation sensors



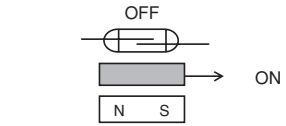
Application Examples:
Pressure sensors and wind pressure sensors



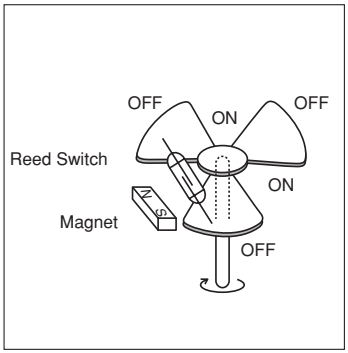
Application Examples:
Various types of fluid level sensors (flow measurement instruments for water, gas and wind)

Reed Switch Application Examples-III

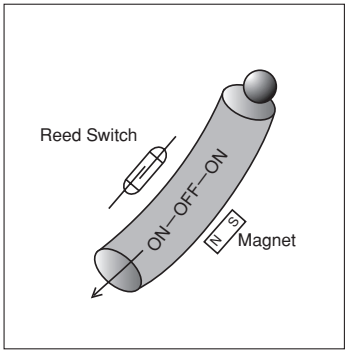
Shielding Operation



Magnetic Material
(Shielding Plate)



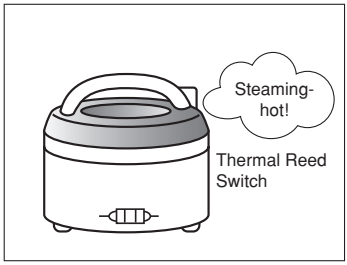
Application Examples: Pulse generator



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

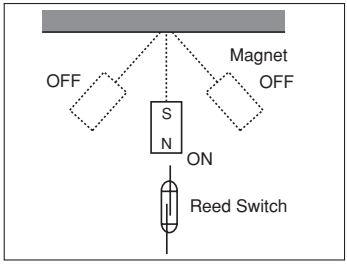
Miscellaneous reed switch application examples

☆ Temperature sensor
(Combination of thermal ferrite)



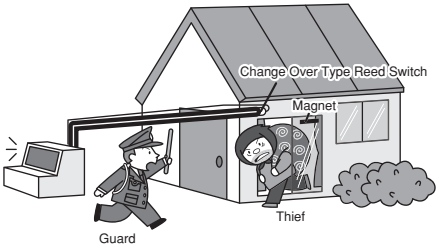
Application Examples: Electronic cooker, heat detector

☆ Tilt detection

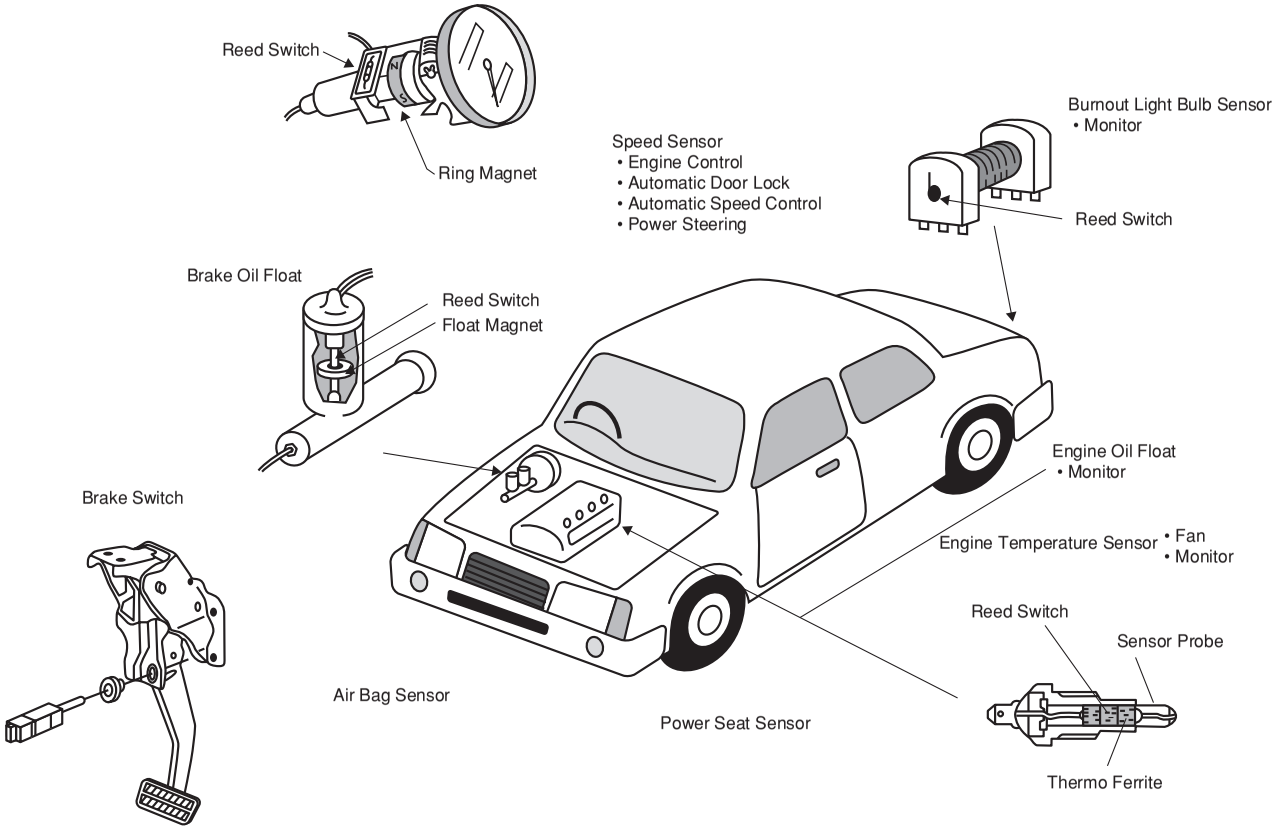


Application Examples: Security system, seismic sensor

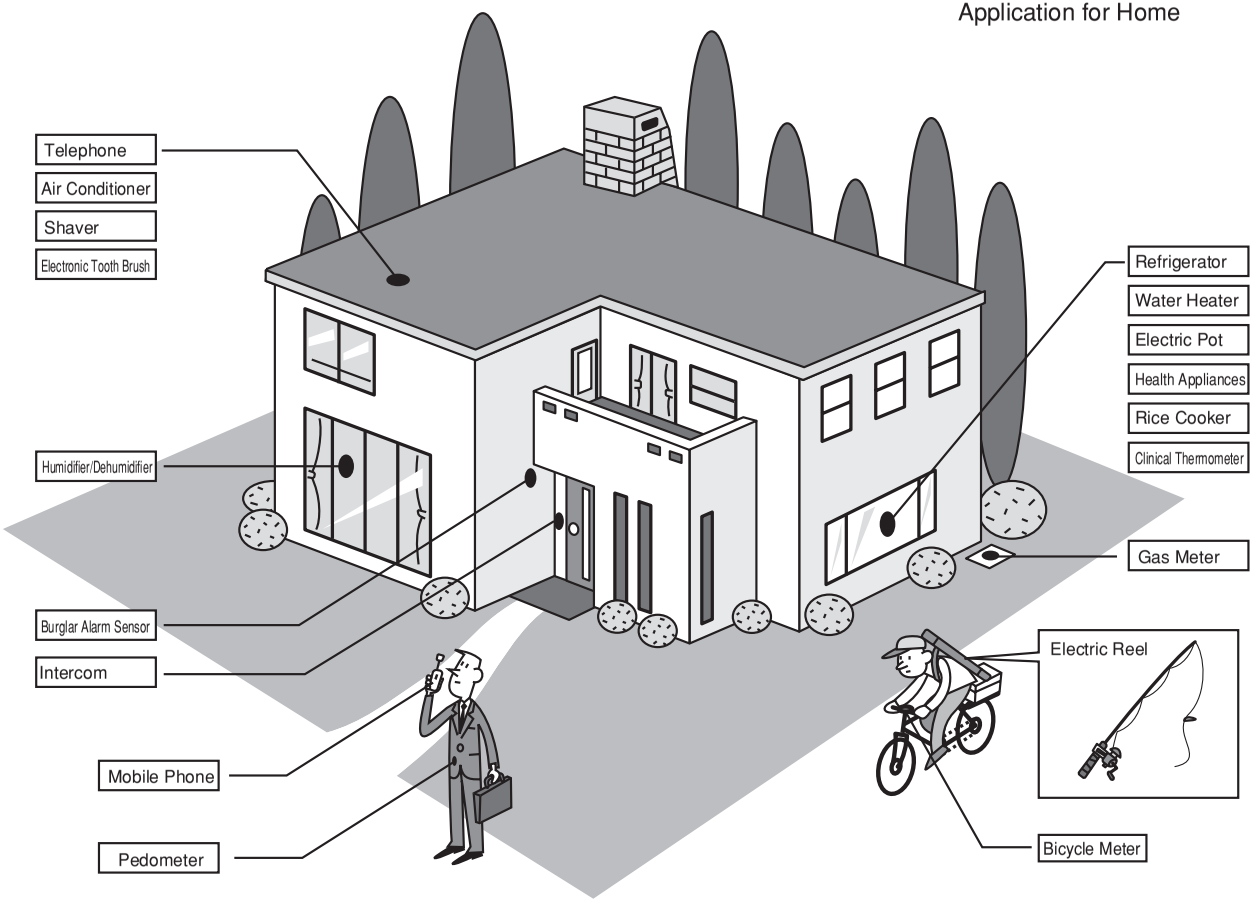
☆ Security system



Reed Switch Application Example: Car



Application for Home



3 Data Sheets

REED SWITCH

ORD213

Super ultra-miniature

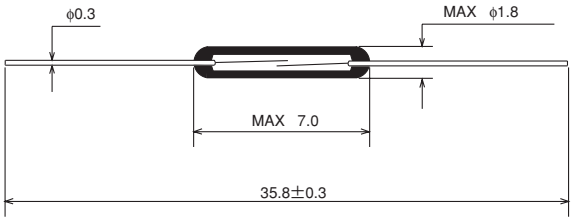
■ GENERAL DESCRIPTION

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

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



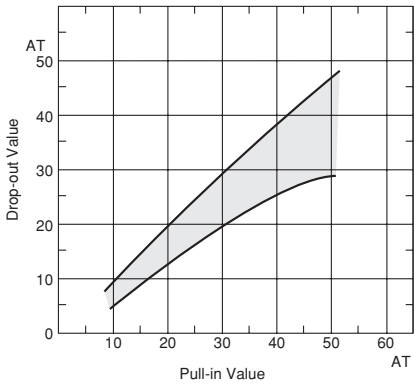
■ APPLICATIONS

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

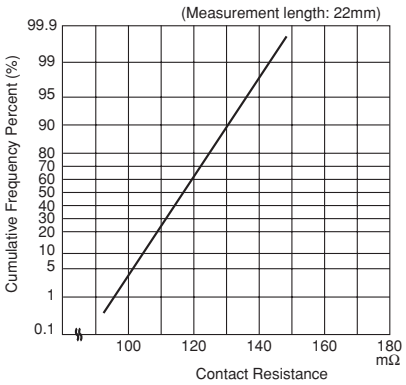
■ ELECTRICAL CHARACTERISTICS

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	10^9min	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

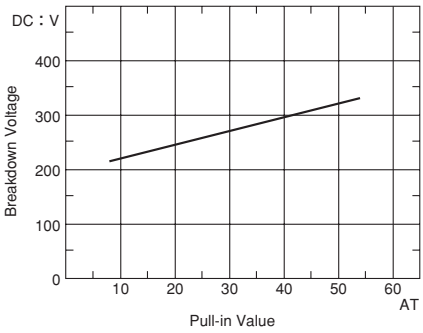
(1) Pull-in Value vs. Drop-out Value



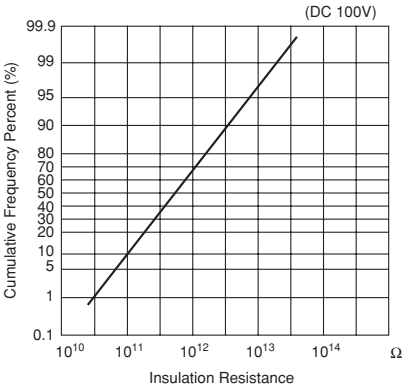
(2) Contact Resistance



(3) Breakdown Voltage

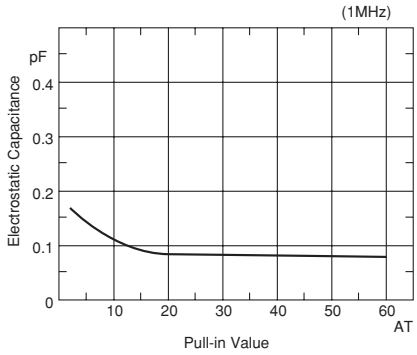


(4) Insulation Resistance



3

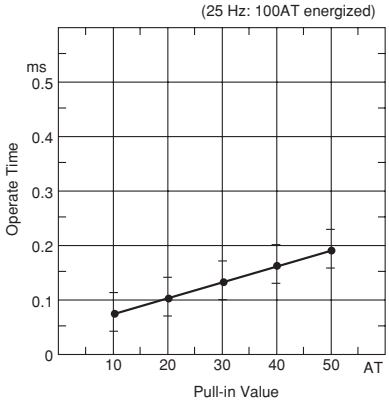
(5) Electrostatic Capacitance



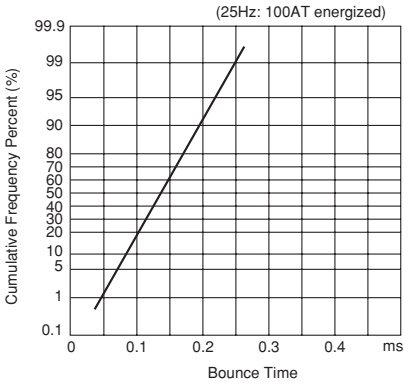
■ OPERATING CHARACTERISTICS

Parameter	Rated Value	Unit
Operate Time	0.3max	ms
Bounce Time	0.3max	ms
Release Time	0.05max	ms
Resonant Frequency	11000±2000	Hz
Maximum Operating Frequency	500	Hz

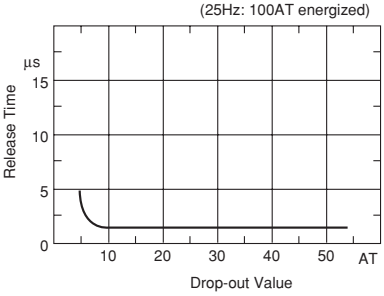
(1) Operate Time



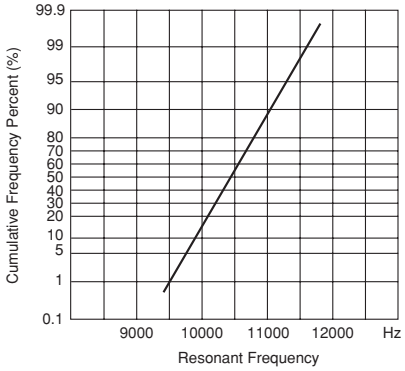
(2) Bounce Time



(3) Release Time

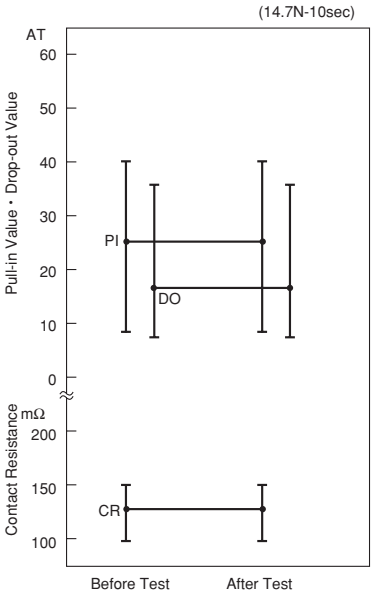


(4) Resonant Frequency

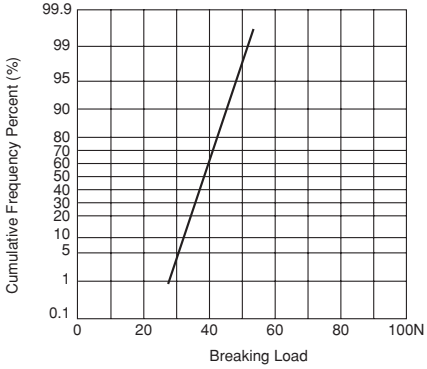


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (Static Load)

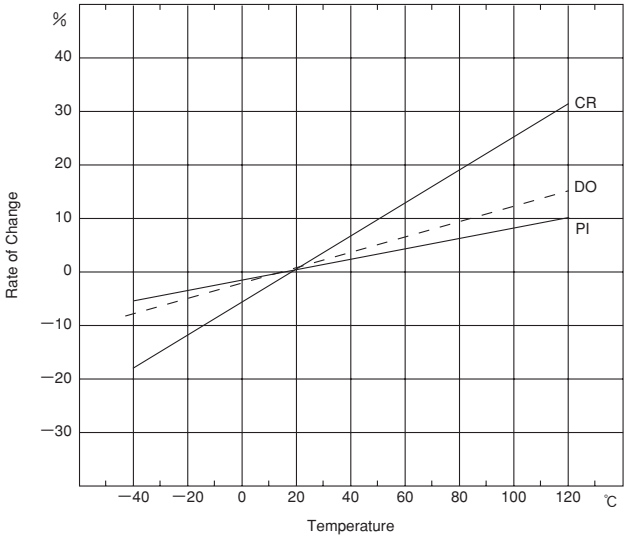


(2) Lead Tensile Strength



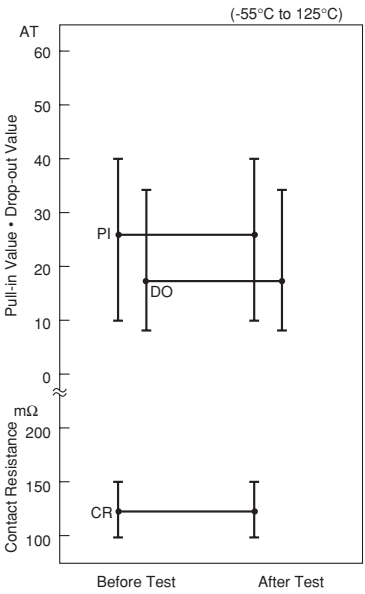
■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature Characteristics

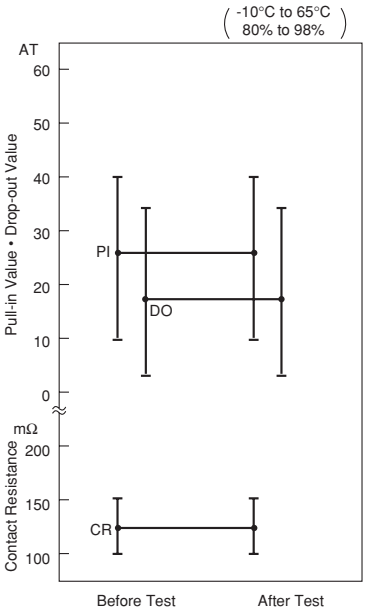


3

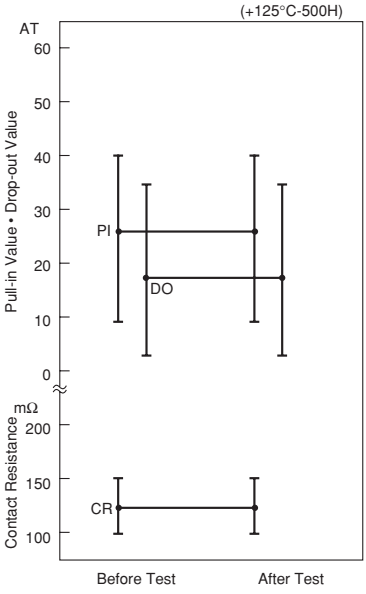
(2) Temperature Cycle



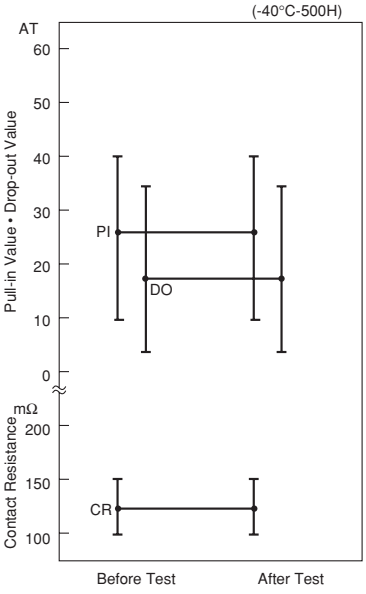
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

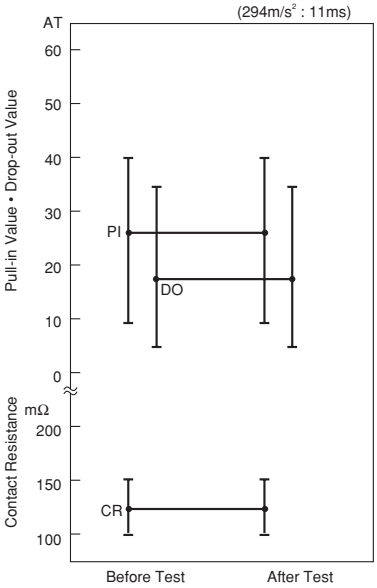


(5) Low Temperature Storage Test

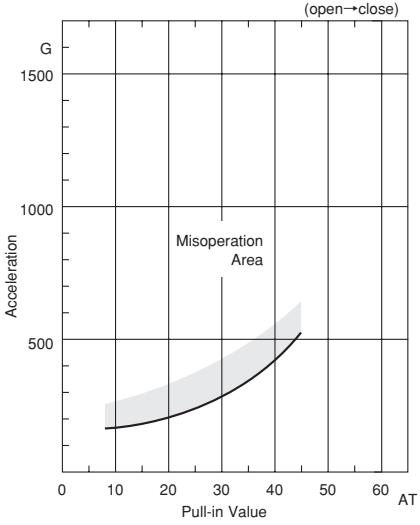


(6) Shock Test

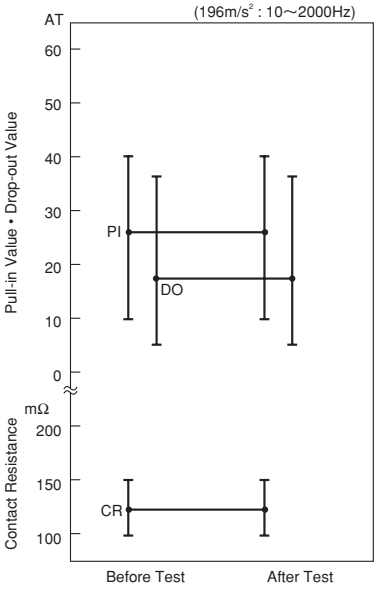
1) Electrical Characteristics



2) Misoperation Area



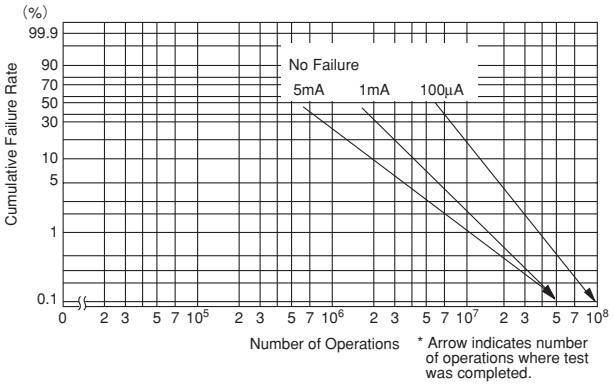
(7) Vibration Test



3

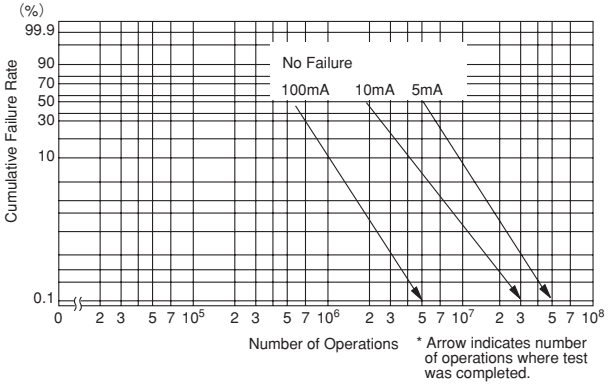
■ LIFE EXPECTANCY DATA: ORD213

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

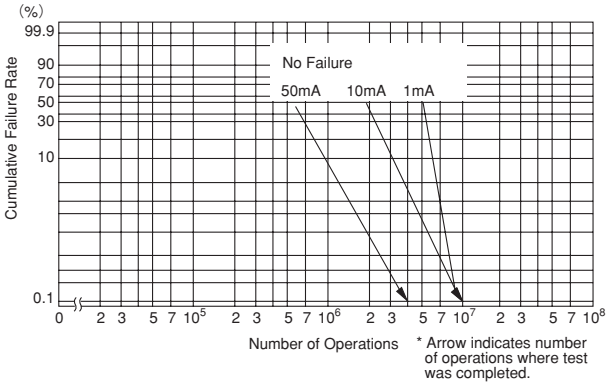


3

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



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



REED SWITCH

ORD311

Super ultra-miniature long life

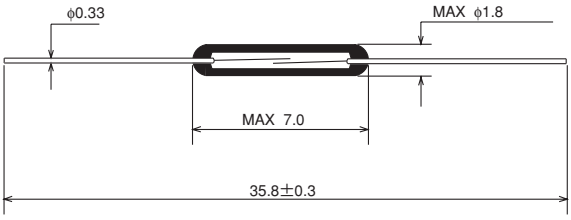
■ GENERAL DESCRIPTION

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

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

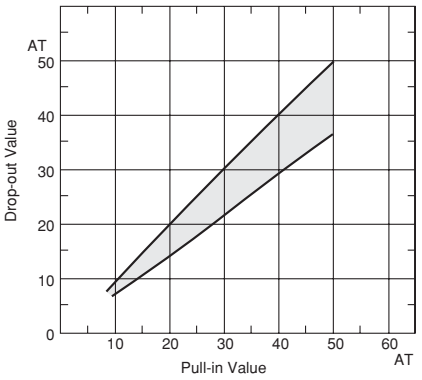
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

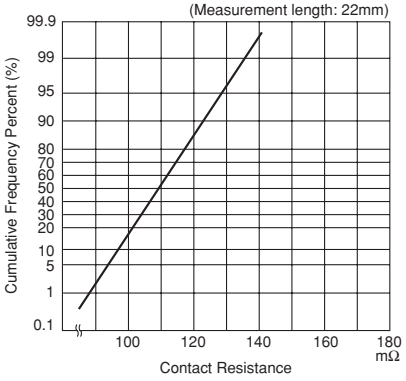
Parameter	Rated Value	Unit
Pull-in Value (PI)	10～40	AT
Drop-out Value (DO)	5min	AT
Contact Resistance (CR)	200max	mΩ
Breakdown Voltage	250min	VDC
Insulation Resistance	10^9min	Ω
Electrostatic Capacitance	0.4max	pF
Contact Rating	10	VA
Maximum Switching Voltage	100 (DC/AC)	V
Maximum Switching Current	0.5	A
Maximum Carry Current	1.0	A

3

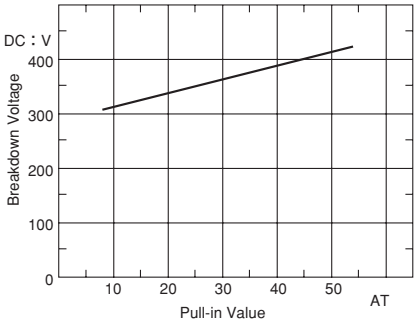
(1) Pull-in Value vs. Drop-out Value



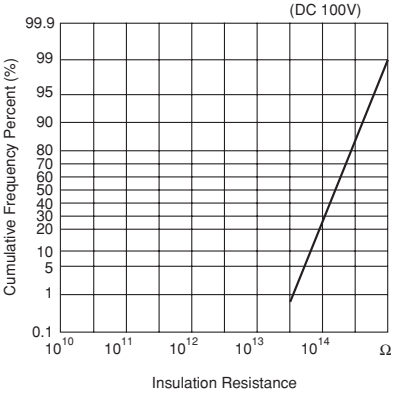
(2) Contact Resistance



(3) Breakdown Voltage

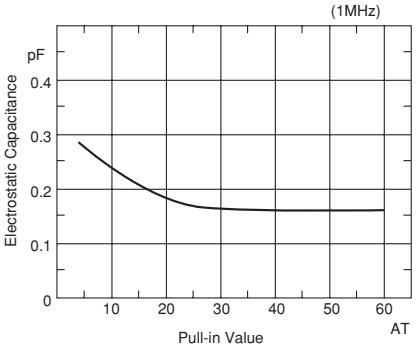


(4) Insulation Resistance



3

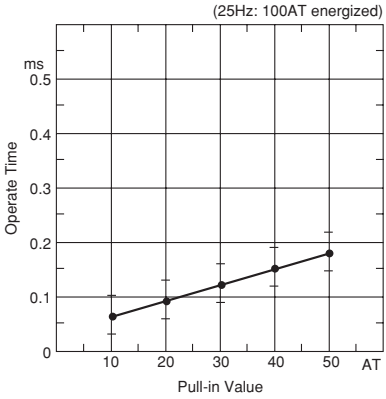
(5) Electrostatic Capacitance



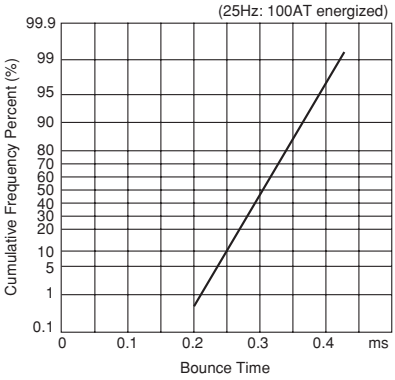
■ OPERATING CHARACTERISTICS

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

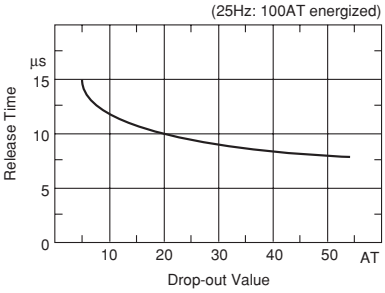
(1) Operate Time



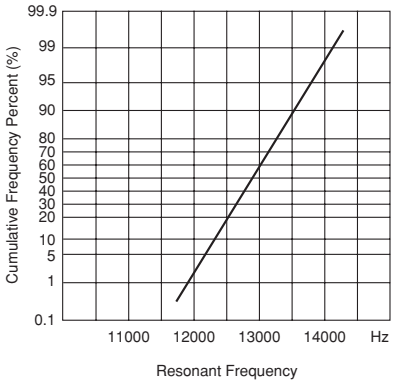
(2) Bounce Time



(3) Release Time

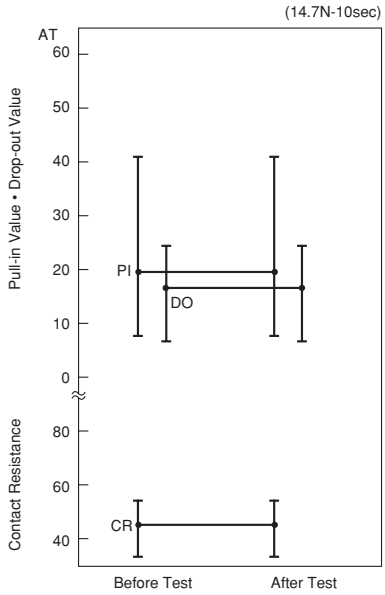


(4) Resonant Frequency

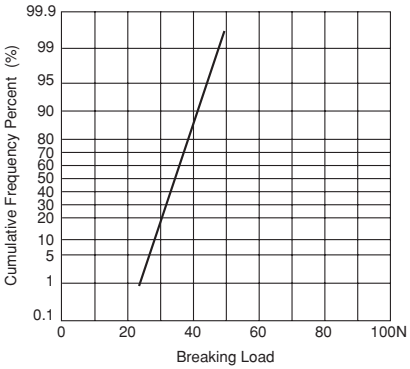


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (Static Load)

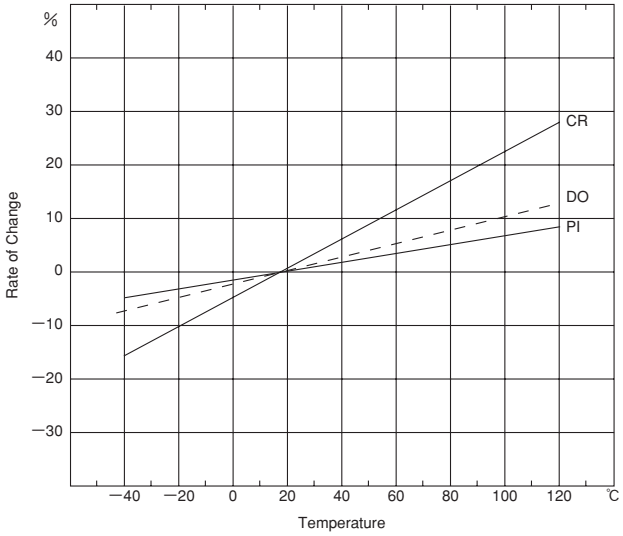


(2) Lead Tensile Strength



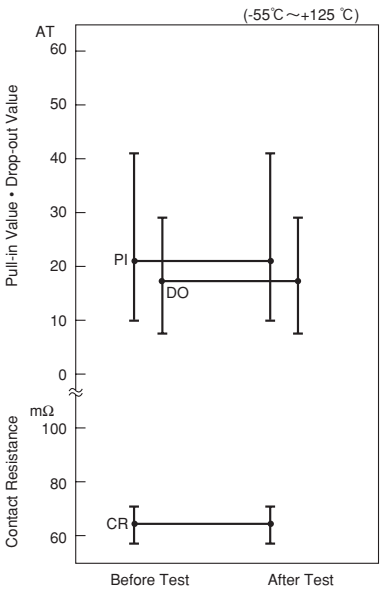
■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature Characteristics

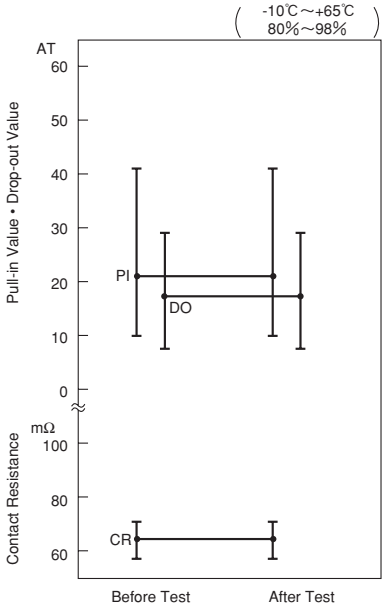


3

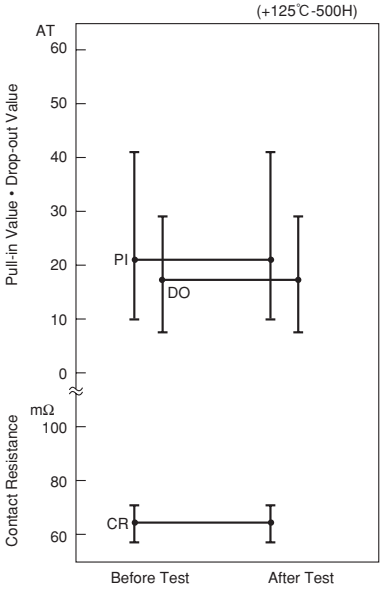
(2) Temperature Cycle



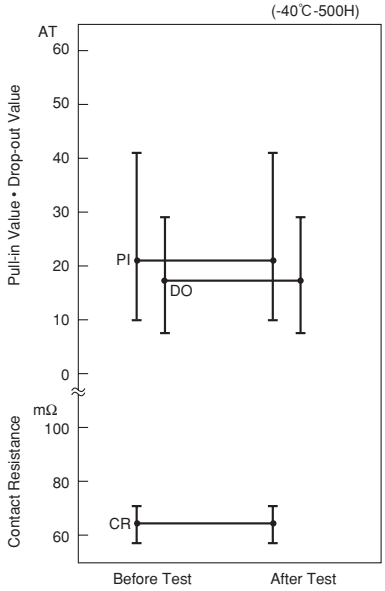
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

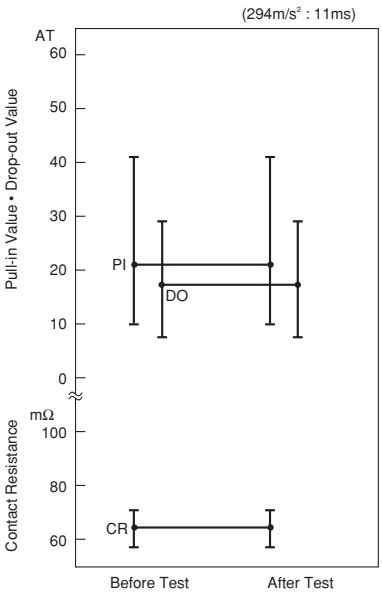


(5) Low Temperature Storage Test

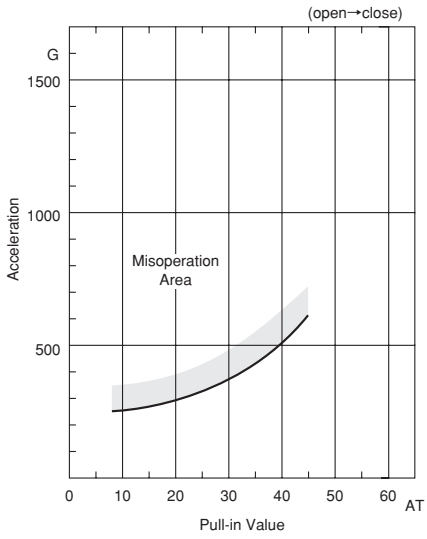


(6) Shock Test

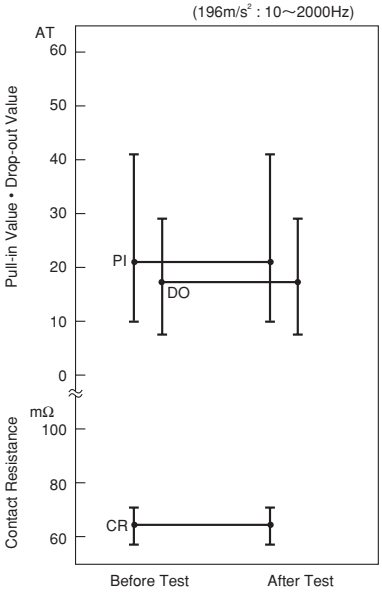
1) Electrical Characteristics



2) Misoperation Area



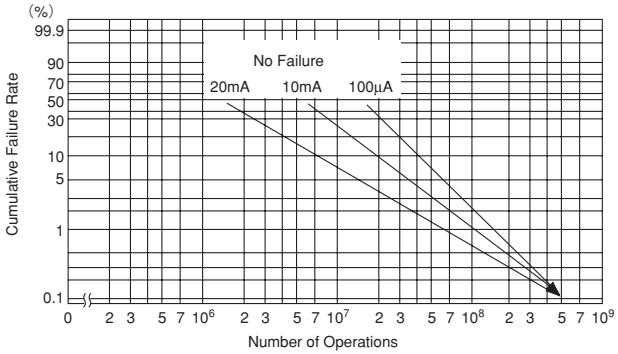
(7) Vibration Test



3

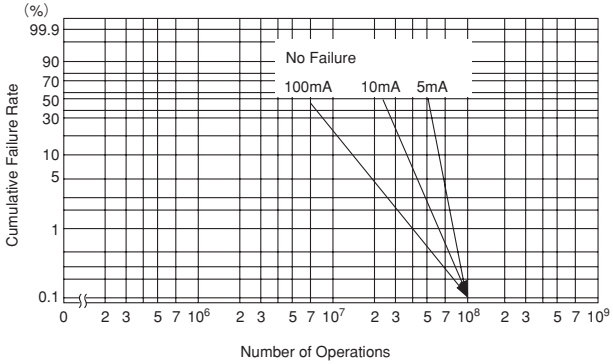
■ LIFE EXPECTANCY DATA: ORD311

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



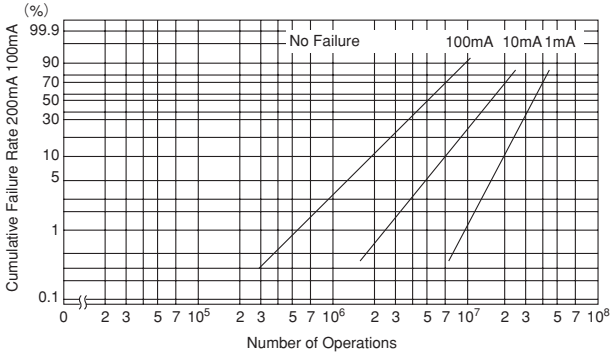
* Arrow indicates number of operations where test was completed.

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



REED SWITCH

ORD211

Ultra-miniature

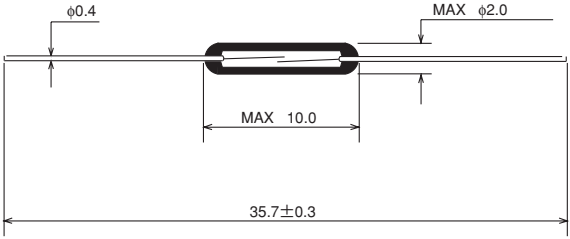
■ GENERAL DESCRIPTION

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

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

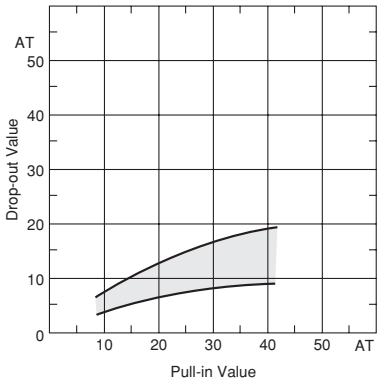
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

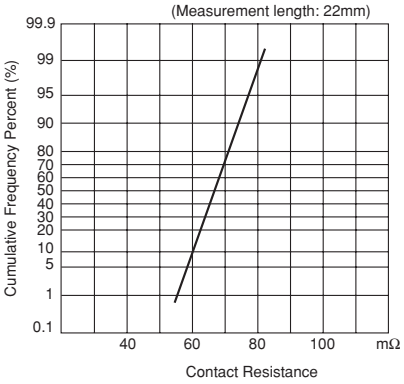
Parameter	Rated Value	Unit
Pull-in Value (PI)	10～40	AT
Drop-out Value (DO)	5min	AT
Contact Resistance (CR)	100max	mΩ
Breakdown Voltage	150min	VDC
Insulation Resistance	10^9min	Ω
Electrostatic Capacitance	0.2max	pF
Contact Rating	1.0	VA
Maximum Switching Voltage	24 ($\frac{DC}{AC}$)	V
Maximum Switching Current	0.1	A
Maximum Carry Current	0.3	A

3

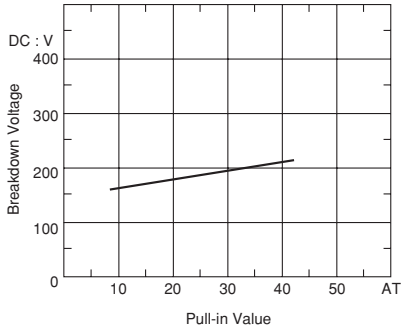
(1) Pull-in Value vs. Drop-out Value



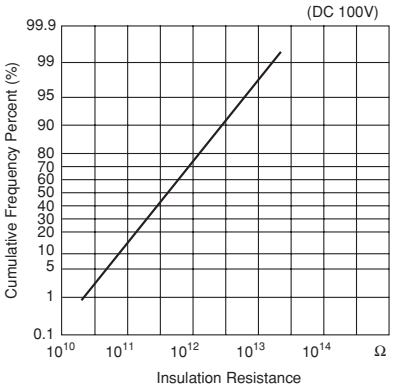
(2) Contact Resistance



(3) Breakdown Voltage

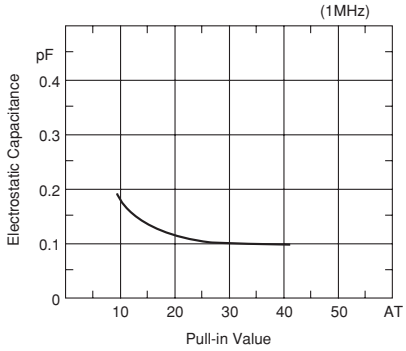


(4) Insulation Resistance



3

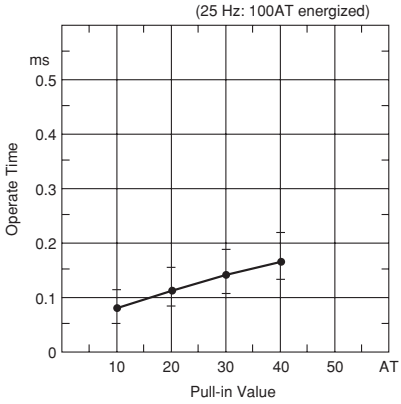
(5) Electrostatic Capacitance



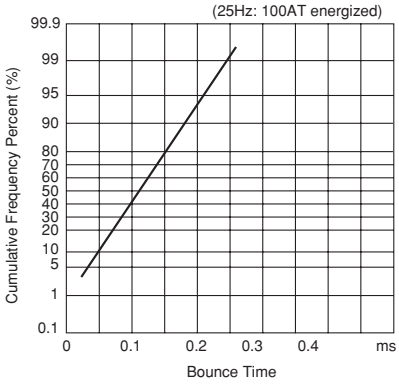
■ OPERATING CHARACTERISTICS

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

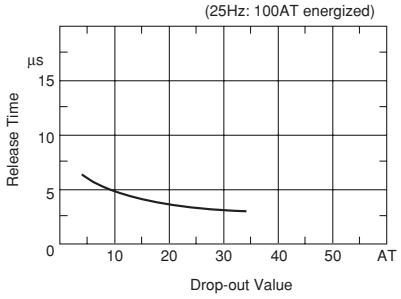
(1) Operate Time



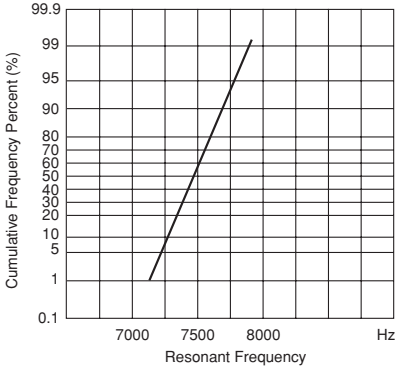
(2) Bounce Time



(3) Release Time

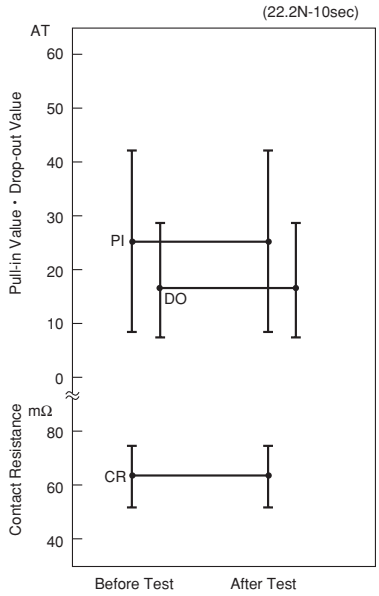


(4) Resonant Frequency

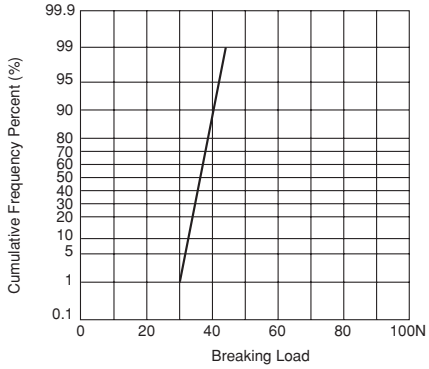


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (Static Load)

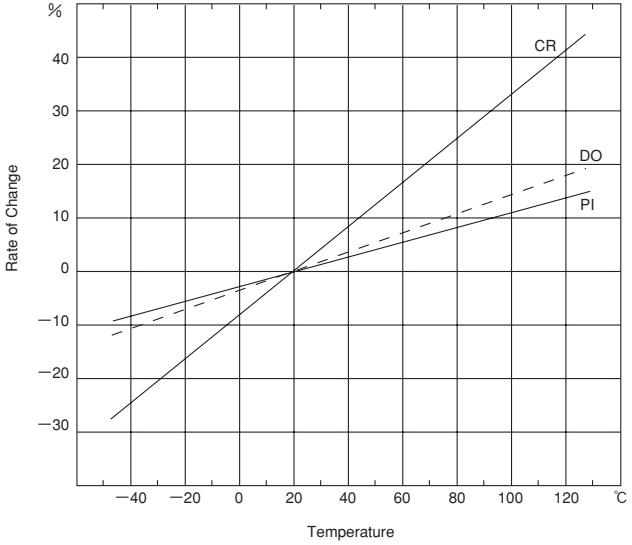


(2) Lead Tensile Strength



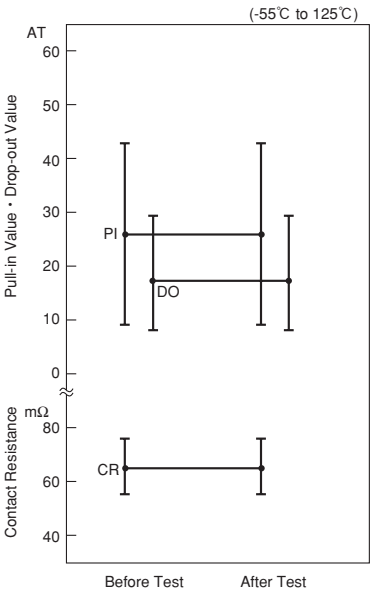
■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature Characteristics

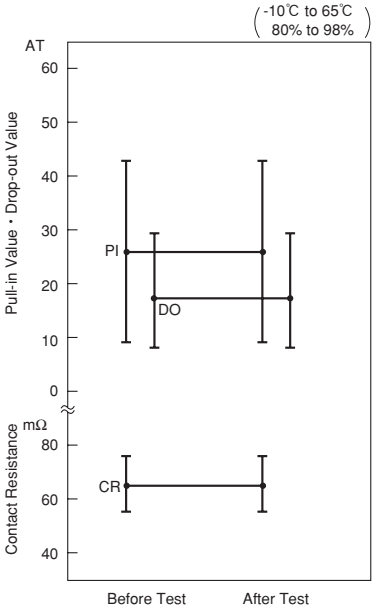


3

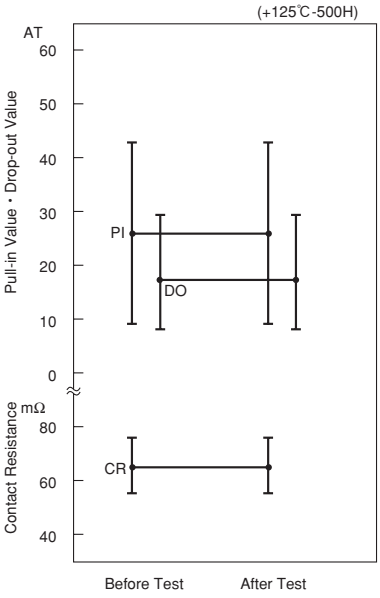
(2) Temperature Cycle



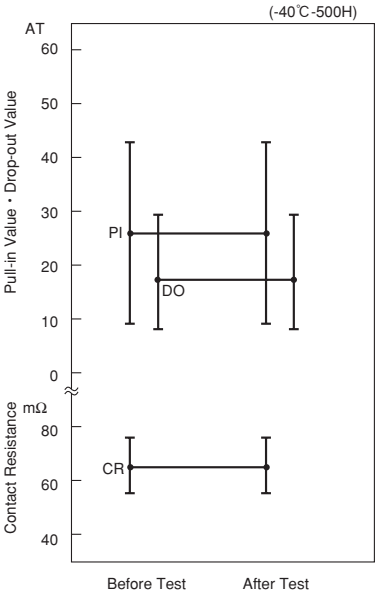
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

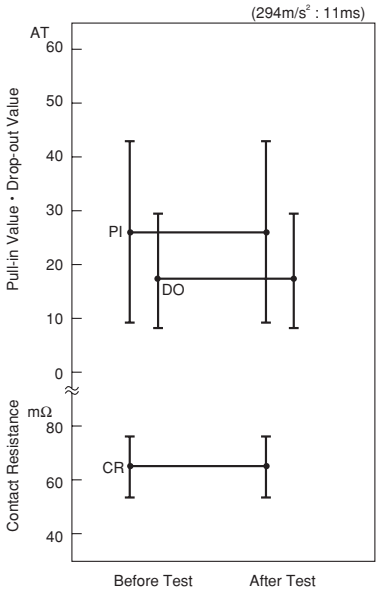


(5) Low Temperature Storage Test

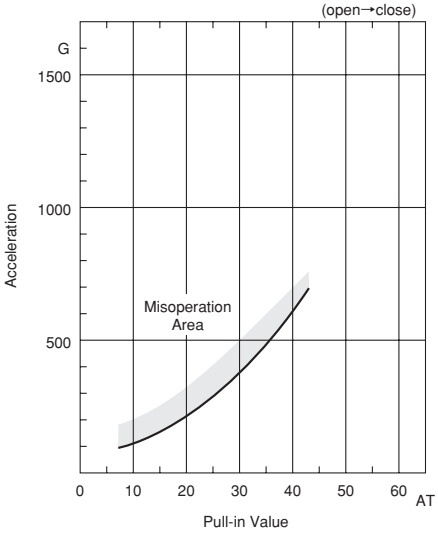


(6) Shock Test

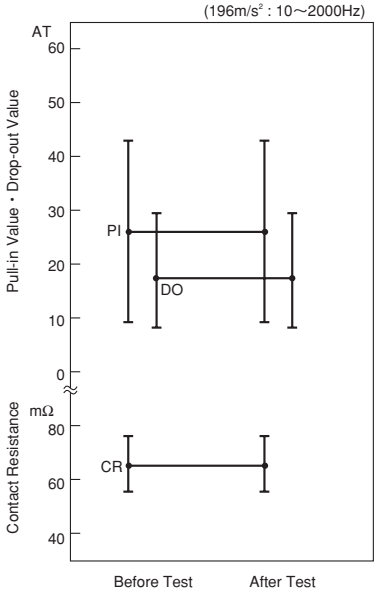
1) Electrical Characteristics



2) Misoperation Area



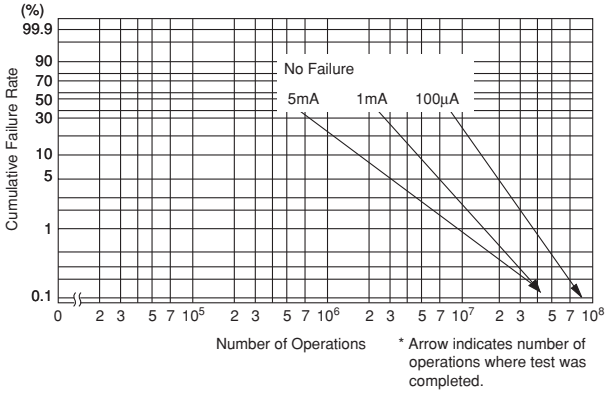
(7) Vibration Test



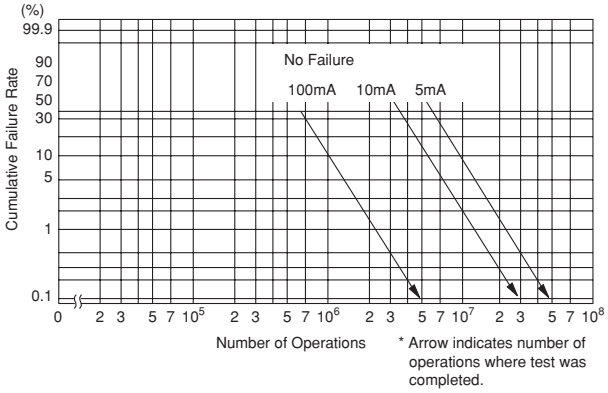
3

■ LIFE EXPECTANCY DATA: ORD211

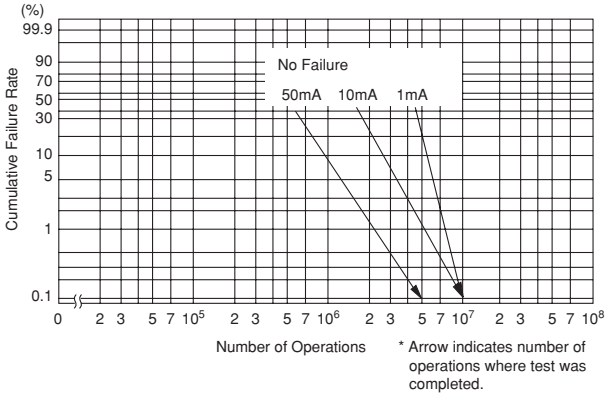
Load Conditions
Voltage: 5VDC
Current: 100μA, 1mA, 5mA
Load: Resistive Load



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

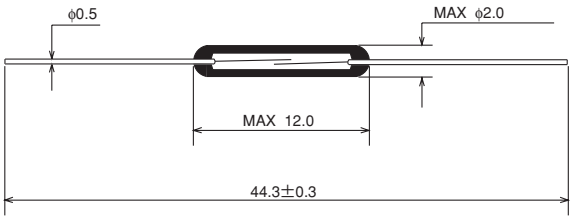
■ GENERAL DESCRIPTION

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

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

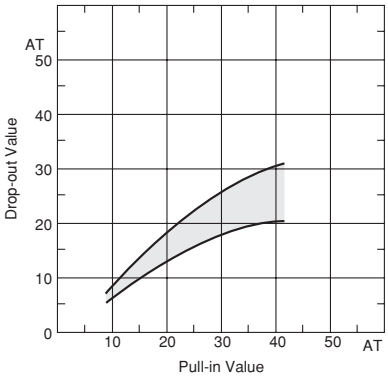
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household Appliances

■ ELECTRICAL CHARACTERISTICS

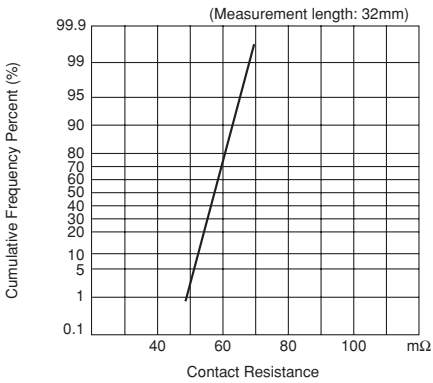
Parameter	Rated Value	Unit
Pull-in Value (PI)	10～40	AT
Drop-out Value (DO)	5min	AT
Contact Resistance (CR)	100max	mΩ
Breakdown Voltage	200min (PI≧20)	VDC
Insulation Resistance	10^9min	Ω
Electrostatic Capacitance	0.3max	pF
Contact Rating	10	VA
Maximum Switching Voltage	100 $\binom{DC}{AC}$	V
Maximum Switching Current	0.5	A
Maximum Carry Current	1.0	A

3

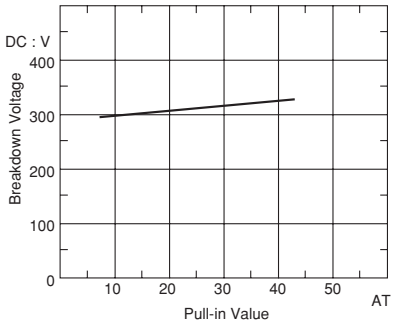
(1) Pull-in Value vs. Drop-out Value



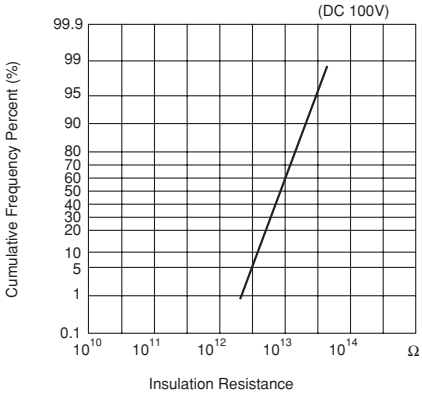
(2) Contact Resistance



(3) Breakdown Voltage

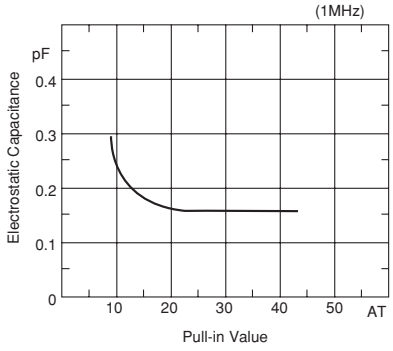


(4) Insulation Resistance



3

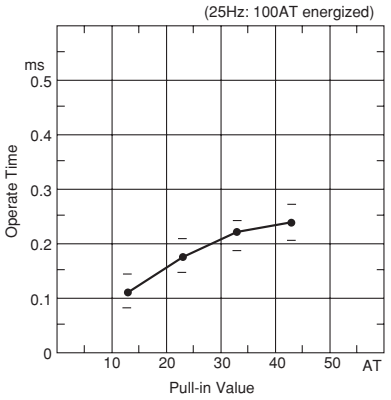
(5) Electrostatic Capacitance



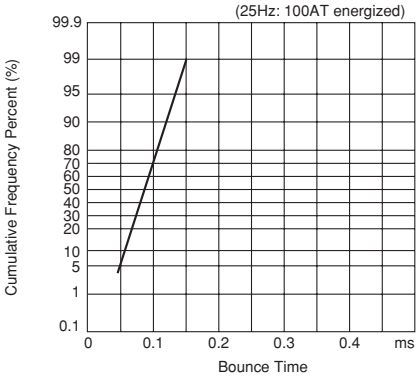
■ OPERATING CHARACTERISTICS

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

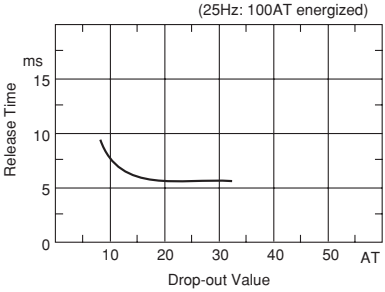
(1) Operate Time



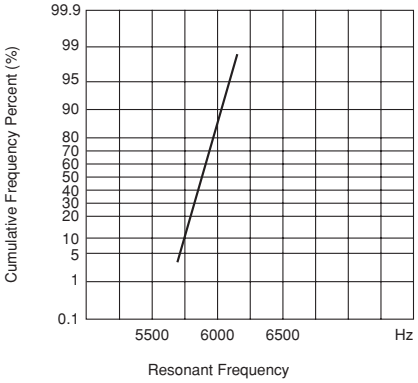
(2) Bounce Time



(3) Release Time

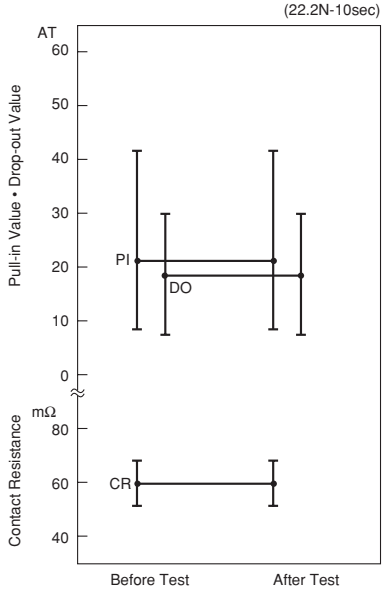


(4) Resonant Frequency

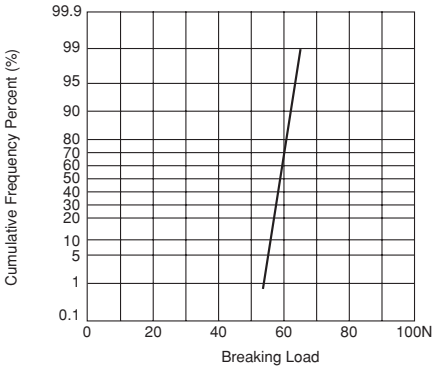


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (Static Load)

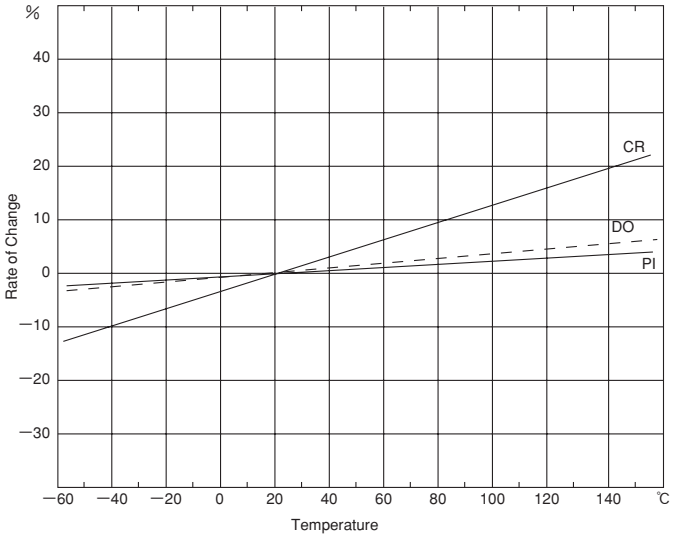


(2) Lead Tensile Strength



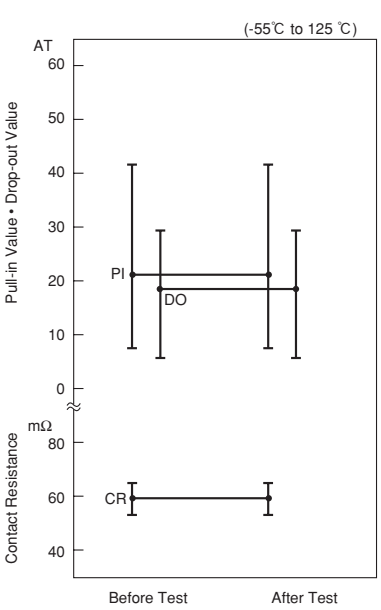
■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature Characteristics

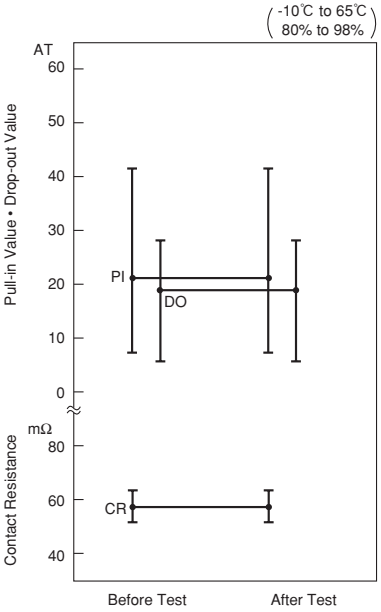


3

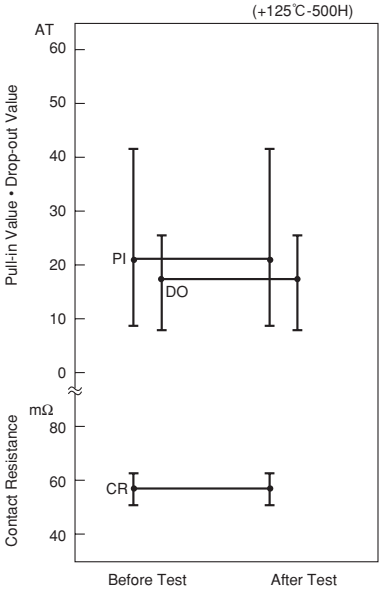
(2) Temperature Cycle



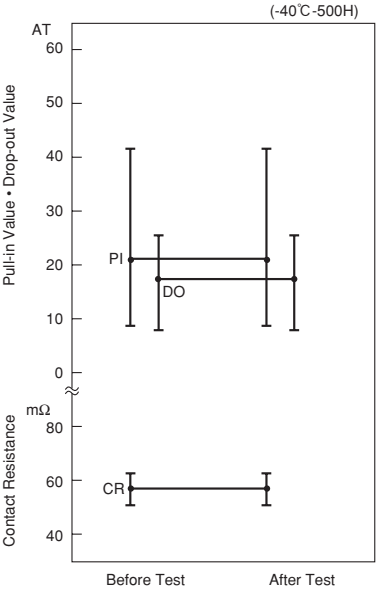
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

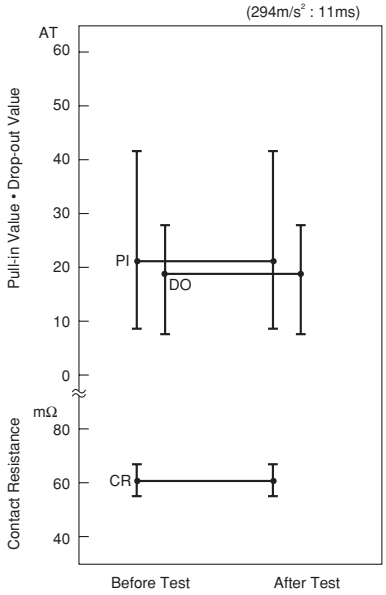


(5) Low Temperature Storage Test

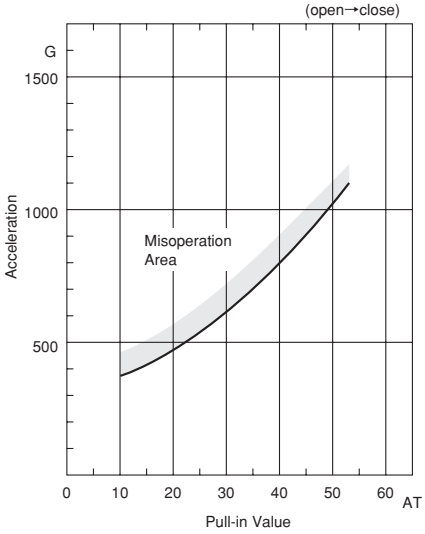


(6) Shock Test

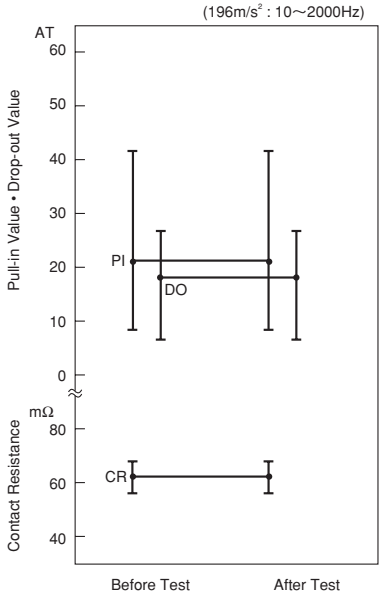
1) Electrical Characteristics



2) Misoperation Area



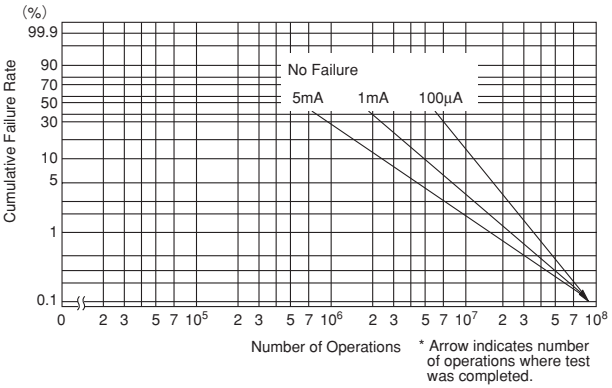
(7) Vibration Test



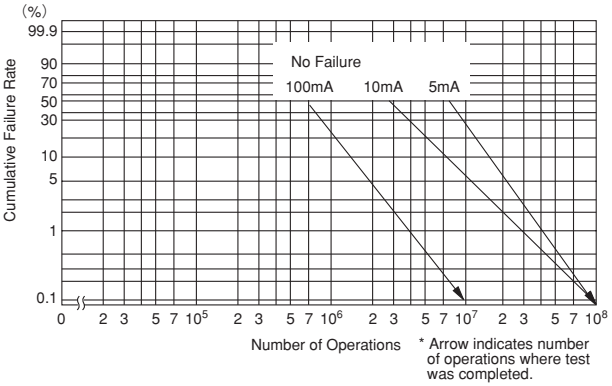
3

■ LIFE EXPECTANCY DATA: ORD219

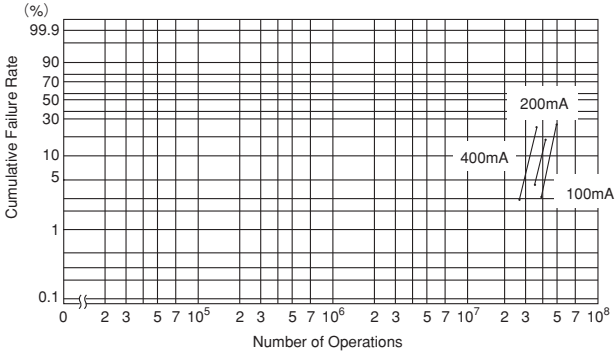
Load Conditions
Voltage: 5VDC
Current: 100μA, 1mA, 5mA
Load: Resistive Load



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



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



REED SWITCH

ORD312

High-power long-life

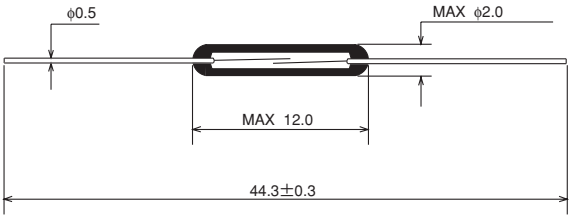
■ GENERAL DESCRIPTION

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

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

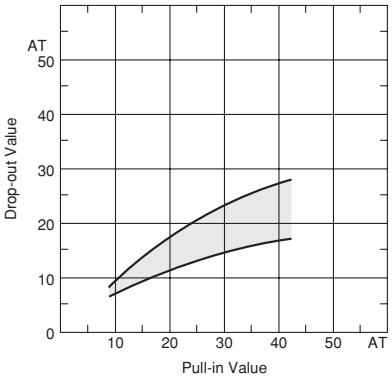
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

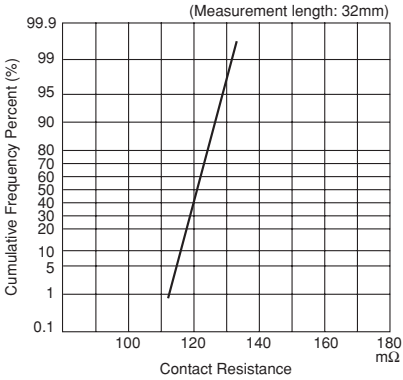
Parameter	Rated Value	Unit
Pull-in Value (PI)	10～40	AT
Drop-out Value (DO)	5min	AT
Contact Resistance (CR)	100max	mΩ
Breakdown Voltage	250min	VDC
Insulation Resistance	10^9min	Ω
Electrostatic Capacitance	0.3max	pF
Contact Rating	30	VA
Maximum Switching Voltage	200DC	V
	100AC	V
Maximum Switching Current	0.5	A
Maximum Carry Current	1.0	A

3

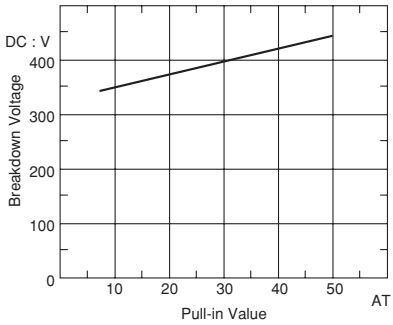
(1) Pull-in Value vs. Drop-out Value



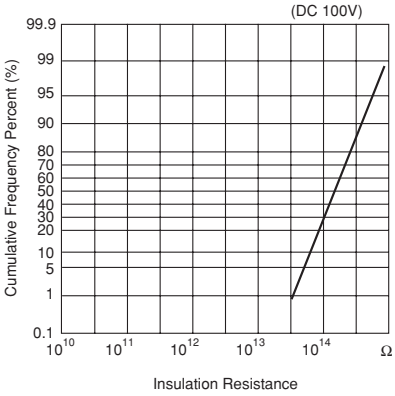
(2) Contact Resistance



(3) Breakdown Voltage

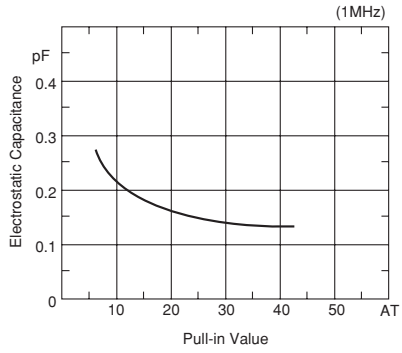


(4) Insulation Resistance



3

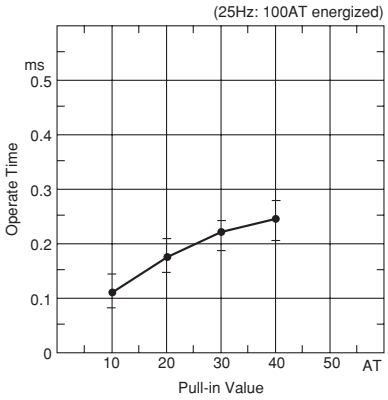
(5) Electrostatic Capacitance



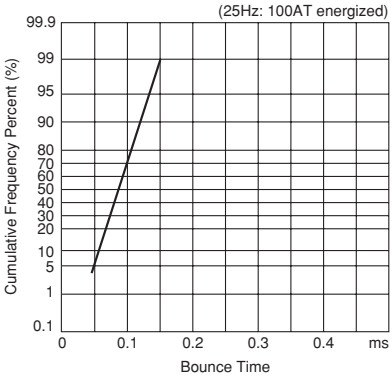
■ OPERATING CHARACTERISTICS

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

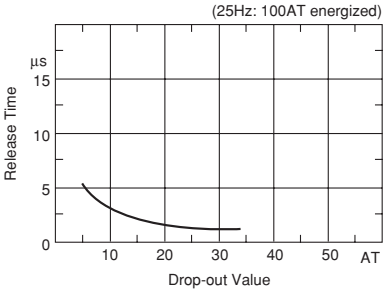
(1) Operate Time



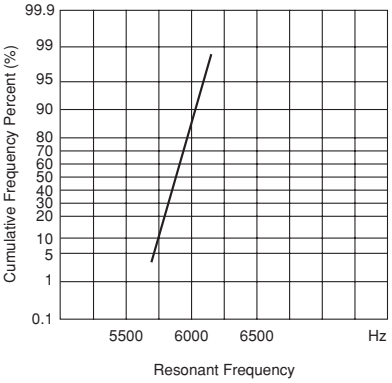
(2) Bounce Time



(3) Release Time

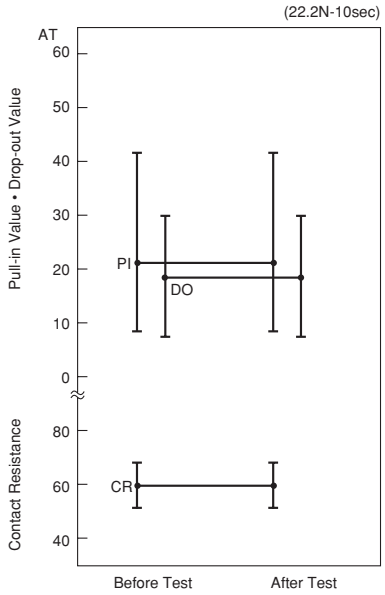


(4) Resonant Frequency

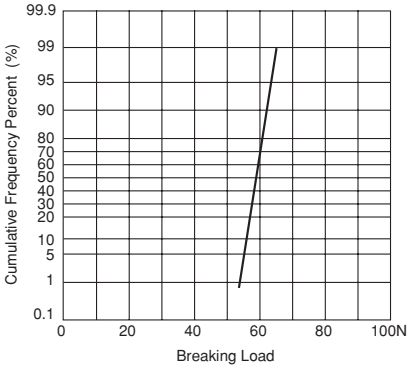


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (Static Load)

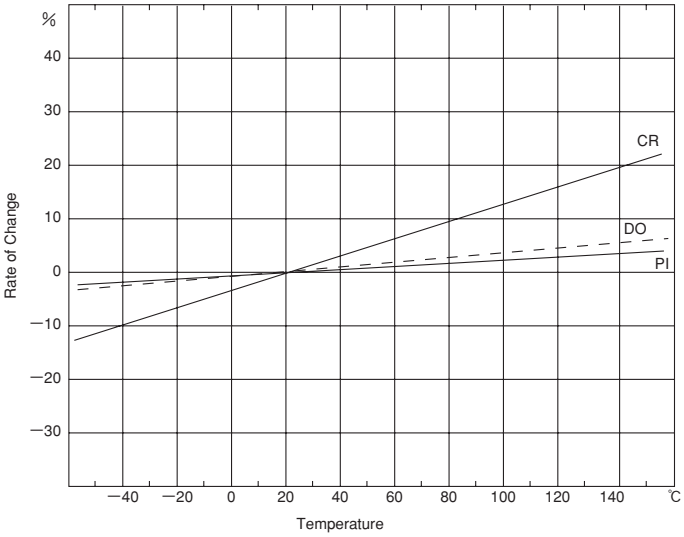


(2) Lead Tensile Strength



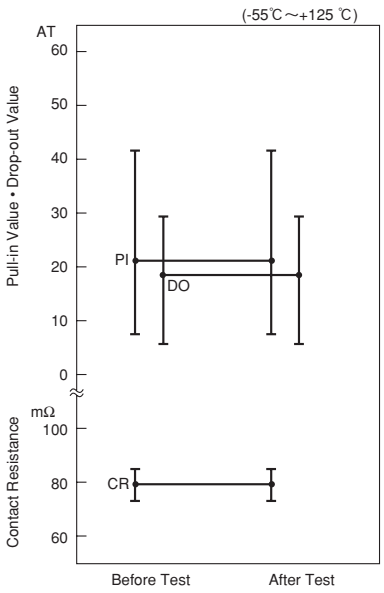
■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature Characteristics

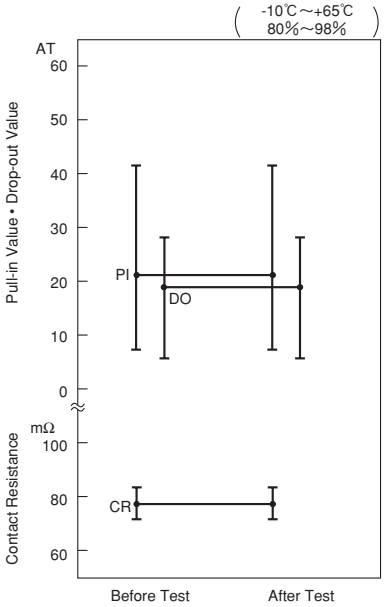


3

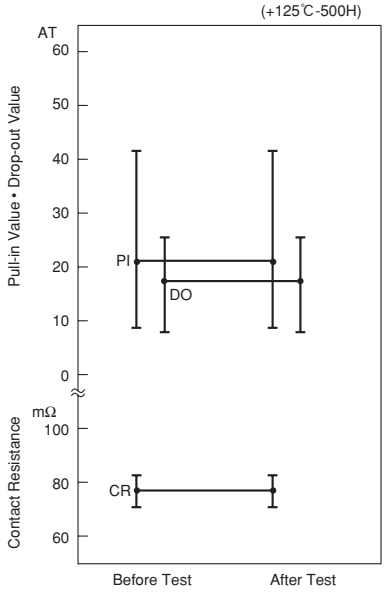
(2) Temperature Cycle



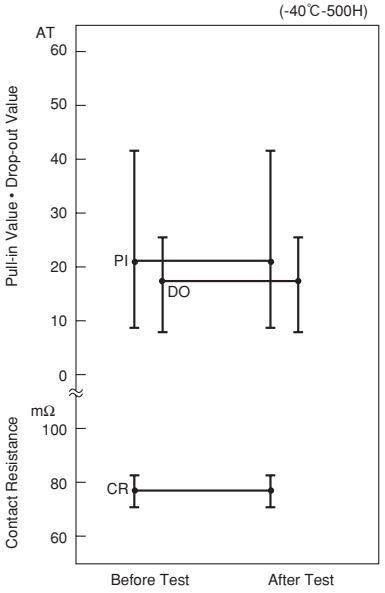
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

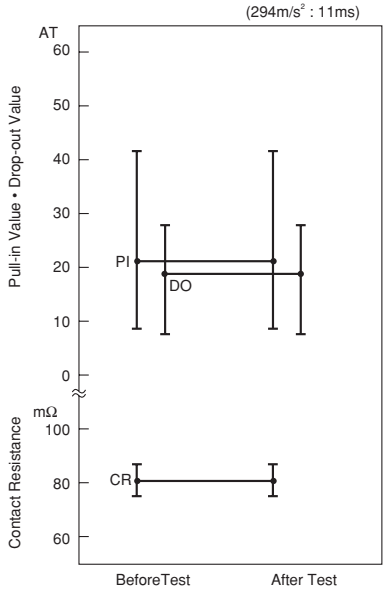


(5) Low Temperature Storage Test

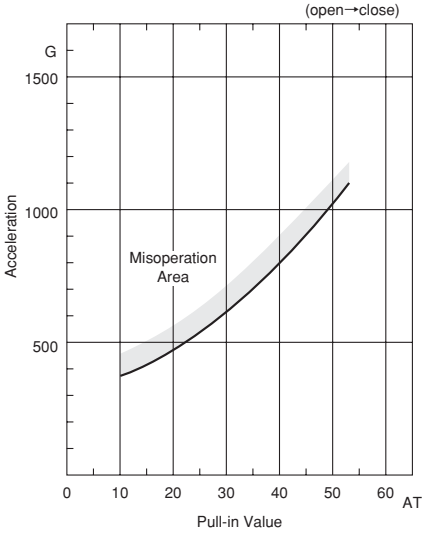


(6) Shock Test

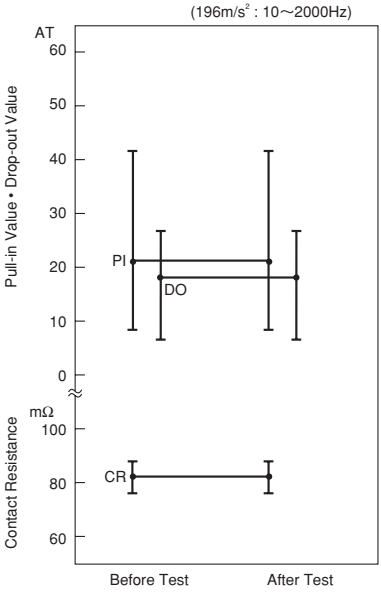
1) Electrical Characteristics



2) Misoperation Area



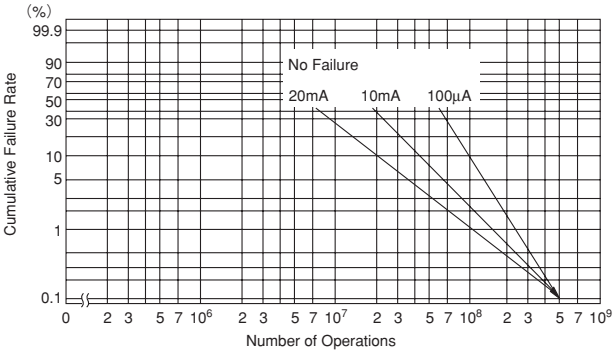
(7) Vibration Test



3

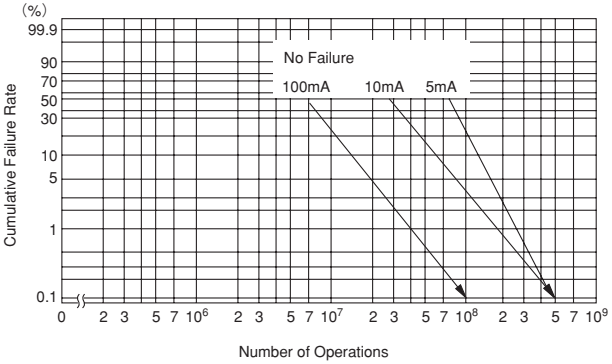
■ LIFE EXPECTANCY DATA: ORD312

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



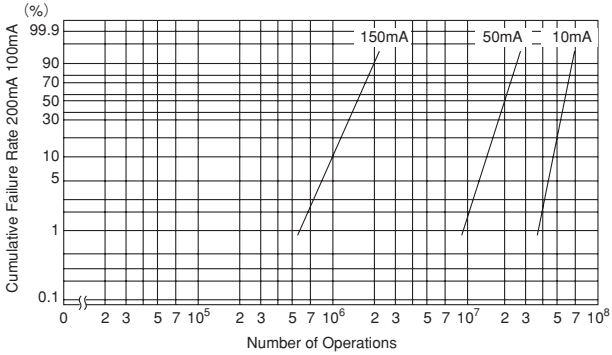
* Arrow indicates number of operations where test was completed.

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.

REED SWITCH

ORD221

Miniature offset-type

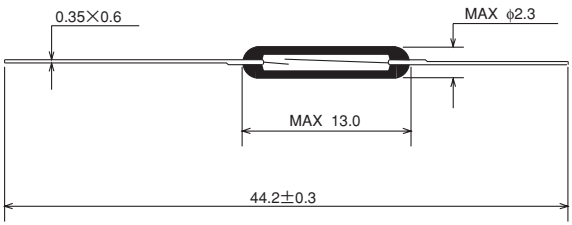
■ GENERAL DESCRIPTION

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

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

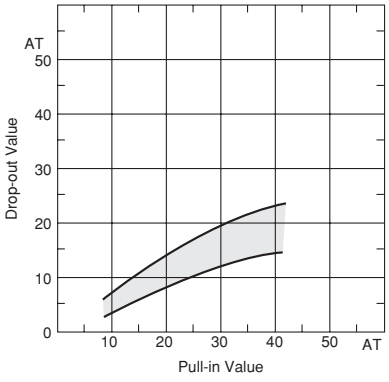
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

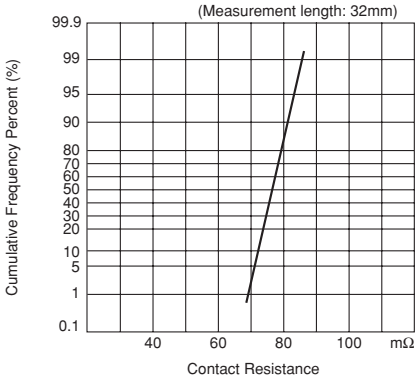
Parameter	Rated Value	Unit
Pull-in Value (PI)	10～30	AT
Drop-out Value (DO)	5min	AT
Contact Resistance (CR)	100max	mΩ
Breakdown Voltage	200 min (PI≧20)	VDC
	150min (10≦PI＜20)	VDC
Insulation Resistance	10^9min	Ω
Electrostatic Capacitance	0.3max	pF
Contact Rating	10	VA
Maximum Switching Voltage	100 $\binom{DC}{AC}$	V
Maximum Switching Current	0.3	A
Maximum Carry Current	1.0	A

3

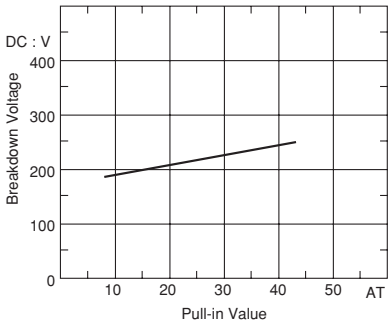
(1) Pull-in Value vs. Drop-out Value



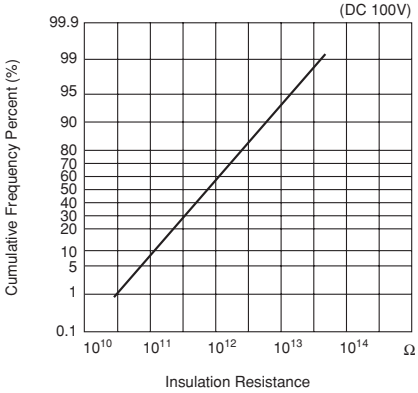
(2) Contact Resistance



(3) Breakdown Voltage

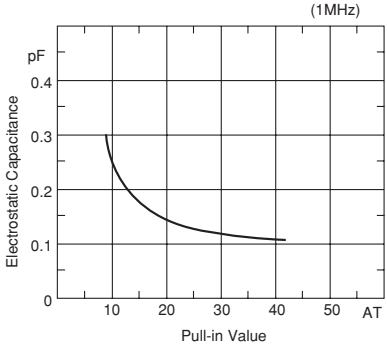


(4) Insulation Resistance



3

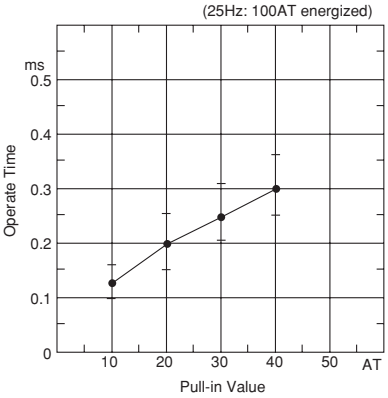
(5) Electrostatic Capacitance



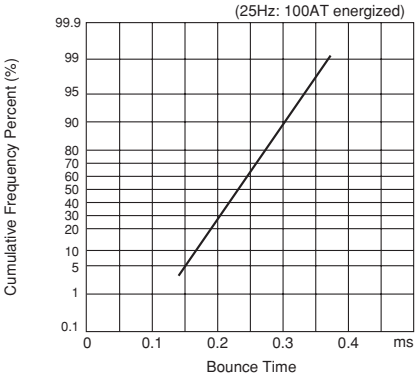
■ OPERATING CHARACTERISTICS

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

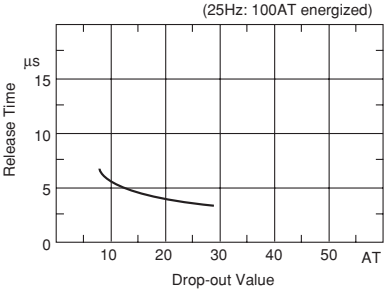
(1) Operate Time



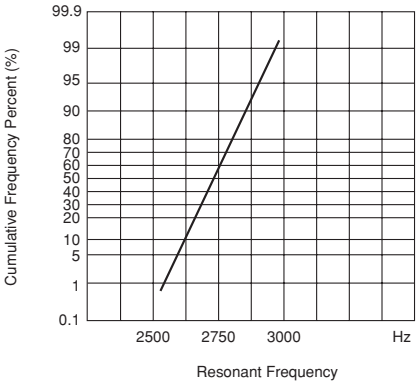
(2) Bounce Time



(3) Release Time

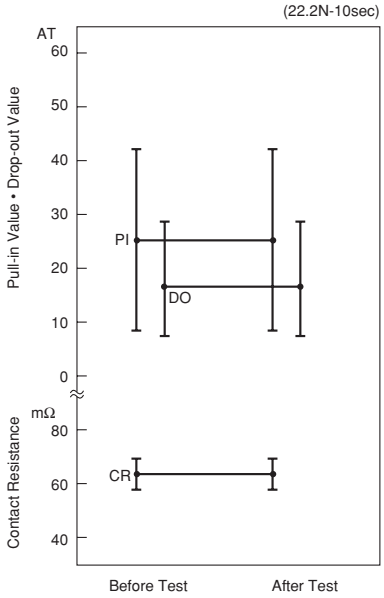


(4) Resonant Frequency

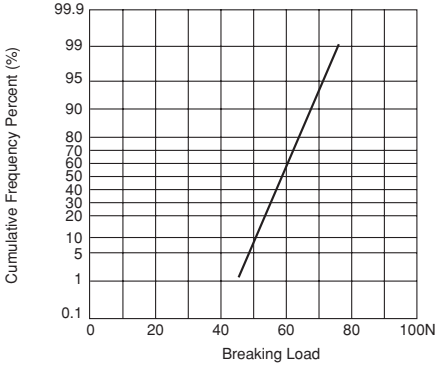


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (Static Load)

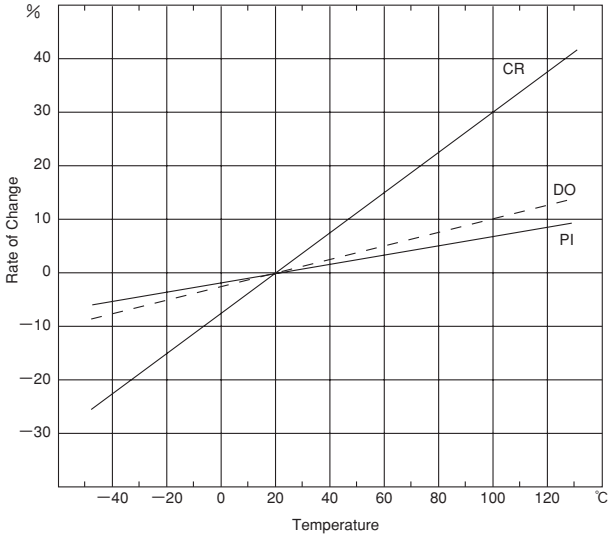


(2) Lead Tensile Strength

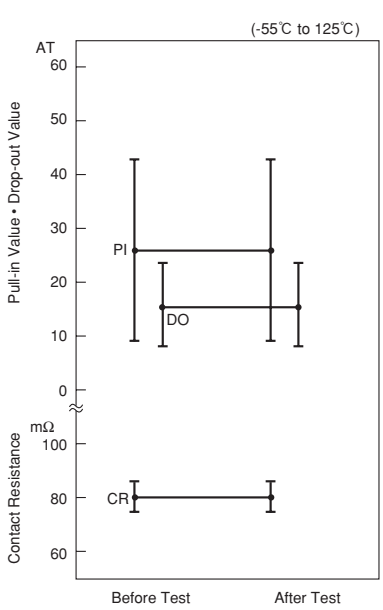


■ ENVIRONMENTAL CHARACTERISTICS

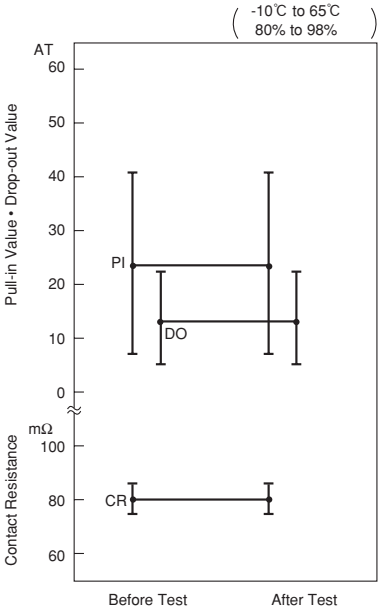
(1) Temperature Characteristics



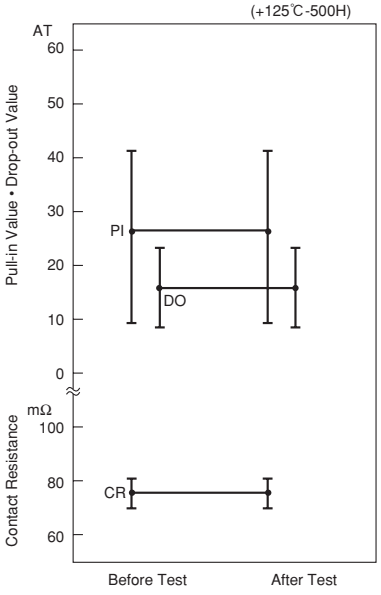
(2) Temperature Cycle



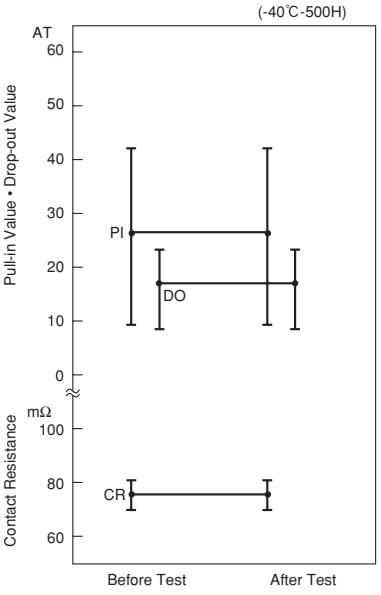
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

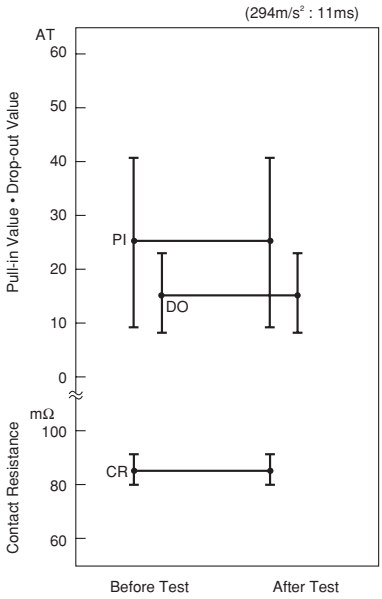


(5) Low Temperature Storage Test

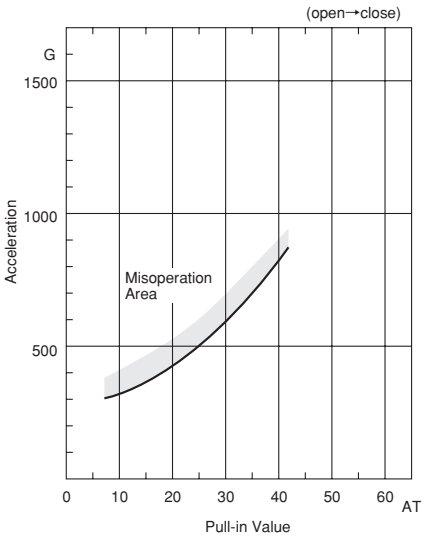


(6) Shock Test

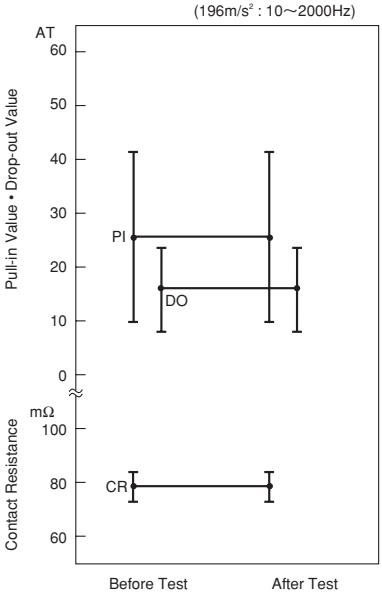
1) Electrical Characteristics



2) Misoperation Area



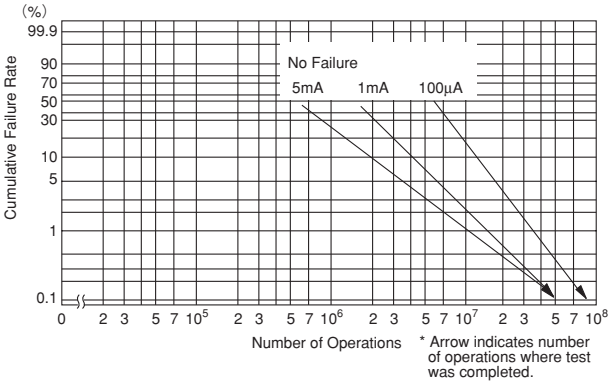
(7) Vibration Test



3

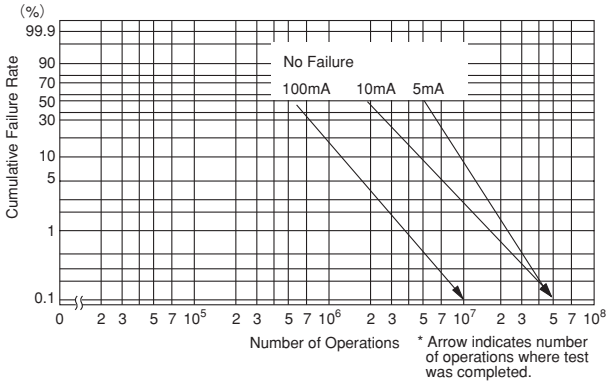
■ LIFE EXPECTANCY DATA: ORD221

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

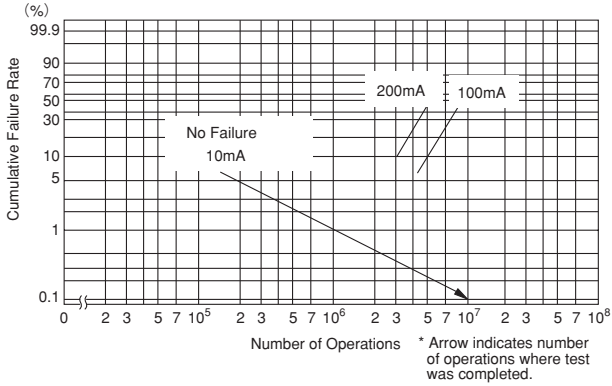


3

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



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



REED SWITCH

ORD2221

Miniature offset, long lead-type

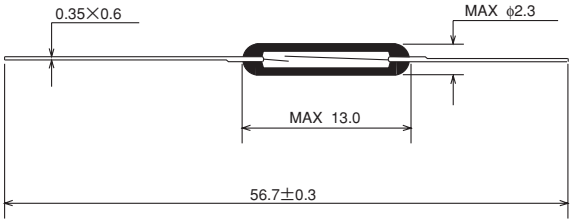
■ GENERAL DESCRIPTION

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

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

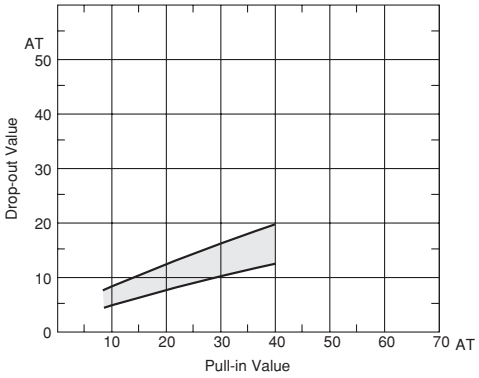
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

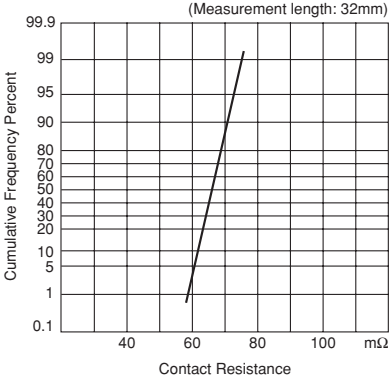
Parameter	Rated Value	Unit
Pull-in Value (PI)	10～30	AT
Drop-out Value (DO)	5min	AT
Contact Resistance (CR)	100max	mΩ
Breakdown Voltage	200min (PI≧20)	VDC
	150min (10≦PI＜20)	VDC
Insulation Resistance	10^9min	Ω
Electrostatic Capacitance	0.3max	pF
Contact Rating	10	VA
Maximum Switching Voltage	100 (DC/AC)	V
Maximum Switching Current	0.3	A
Maximum Carry Current	1.0	A

3

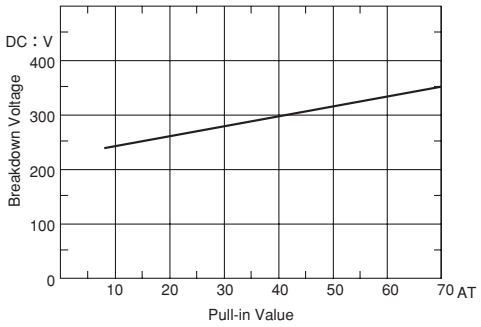
(1) Pull-in Value vs. Drop-out Value



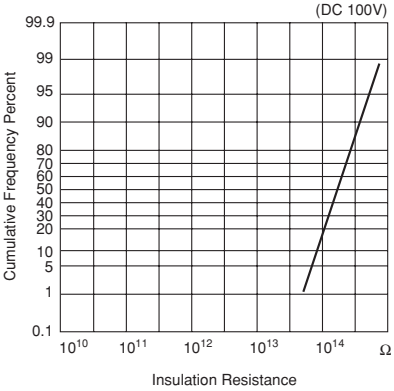
(2) Contact Resistance



(3) Breakdown Voltage

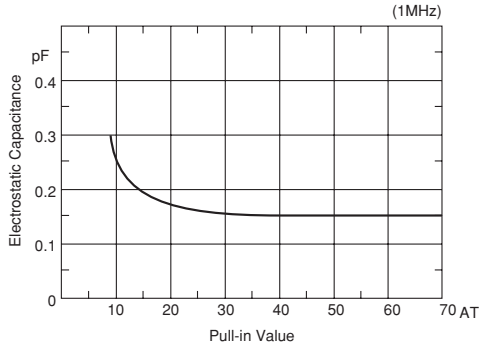


(4) Insulation Resistance



3

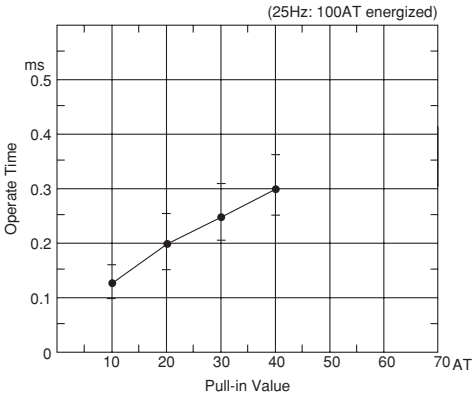
(5) Electrostatic Capacitance



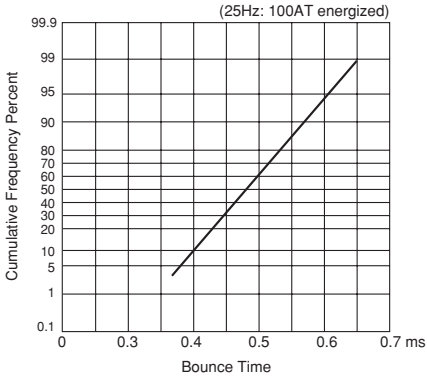
■ OPERATING CHARACTERISTICS

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

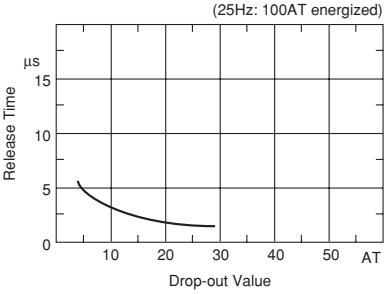
(1) Operate Time



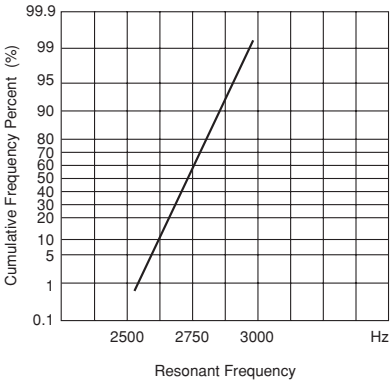
(2) Bounce Time



(3) Release Time

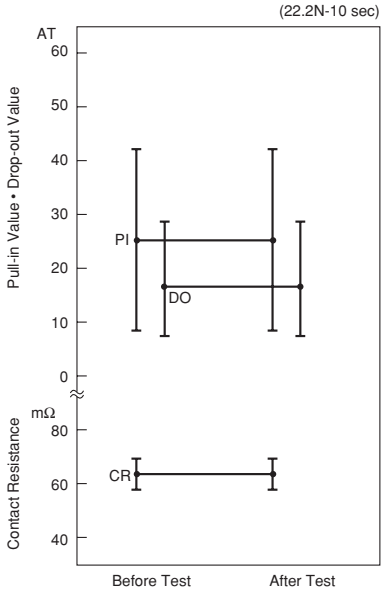


(4) Resonant Frequency

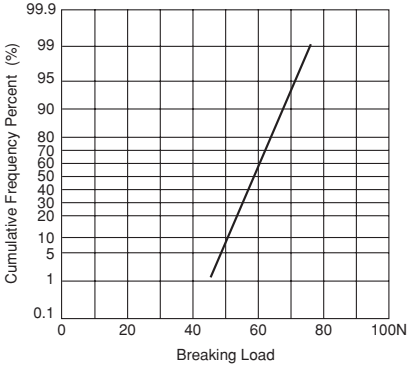


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (Static Load)

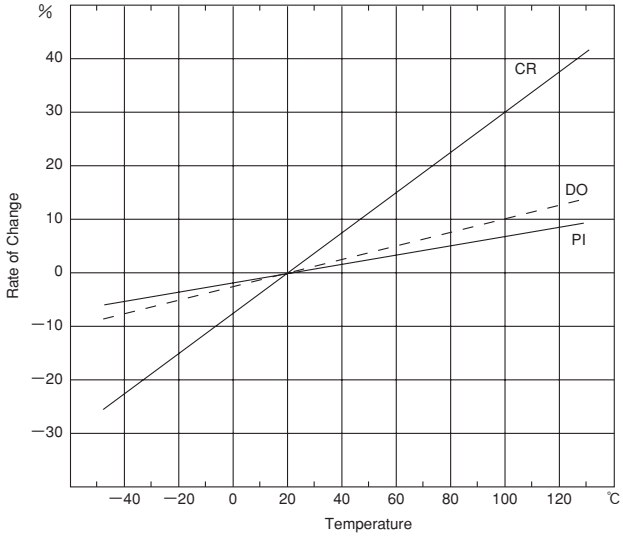


(2) Lead Tensile Strength

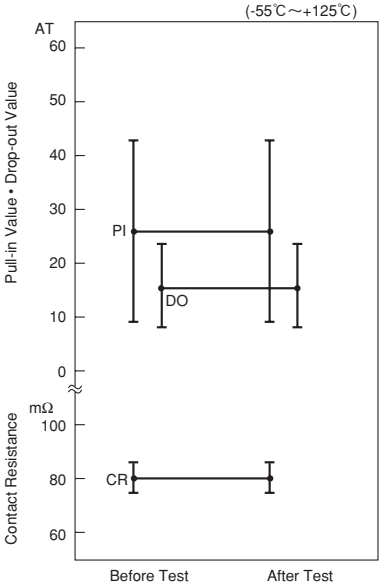


■ ENVIRONMENTAL CHARACTERISTICS

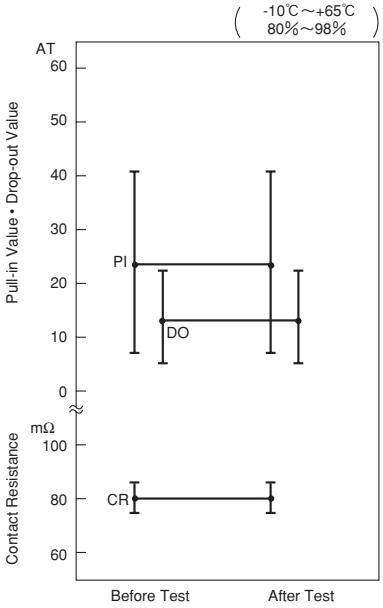
(1) Temperature Characteristics



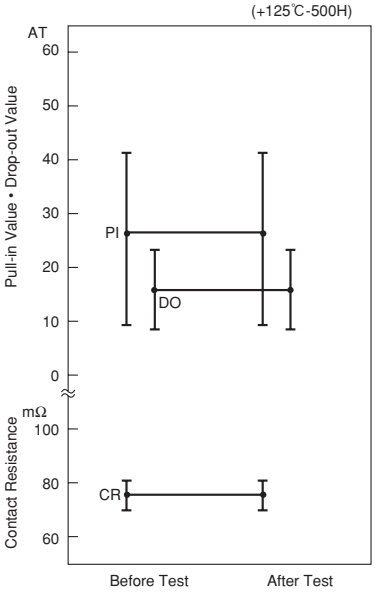
(2) Temperature Cycle



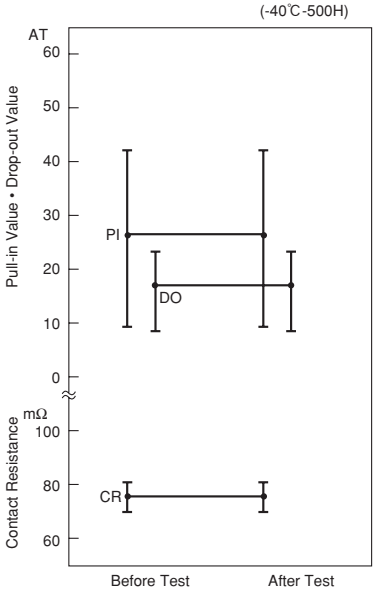
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

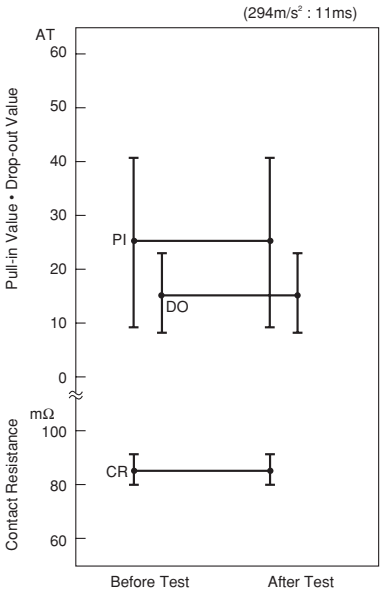


(5) Low Temperature Storage Test

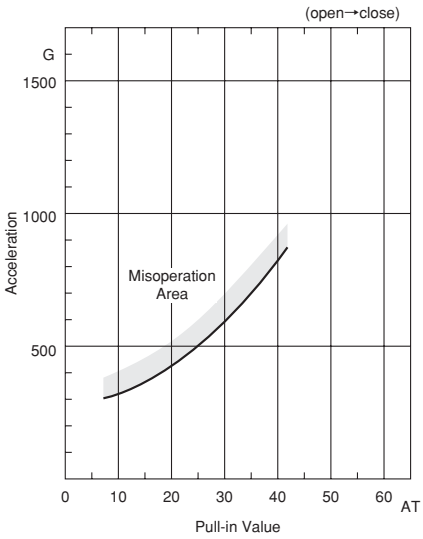


(6) Shock Test

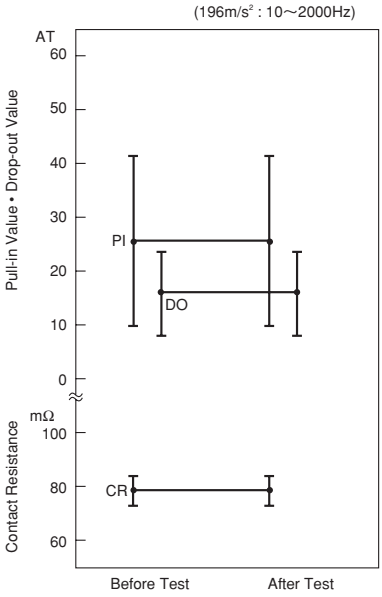
1) Electrical Characteristics



2) Misoperation Area



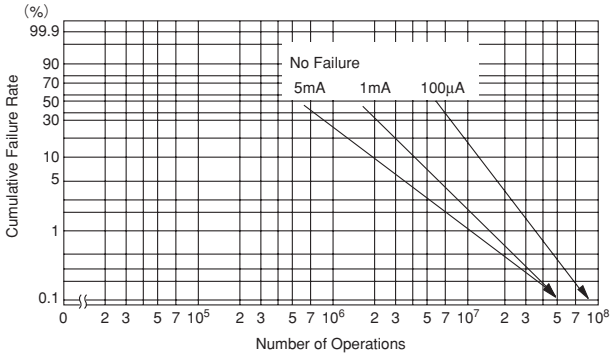
(7) Vibration Test



3

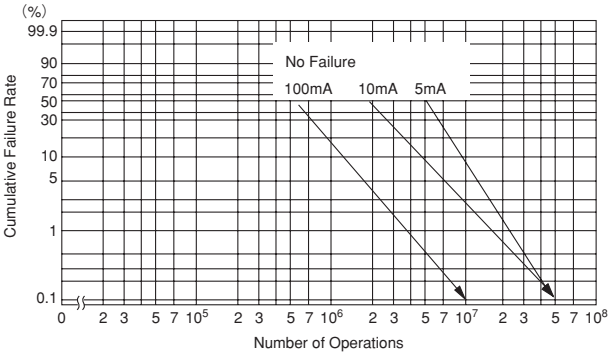
■ LIFE EXPECTANCY DATA: ORD2221

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



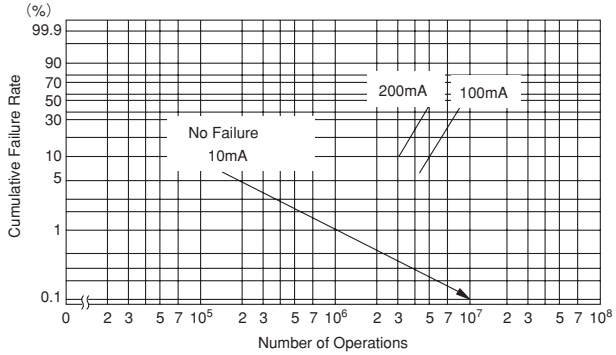
* Arrow indicates number of operations where test was completed.

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



* 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

ORD228VL

Miniature high-performance

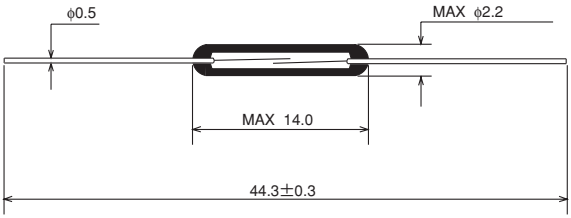
■ GENERAL DESCRIPTION

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

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

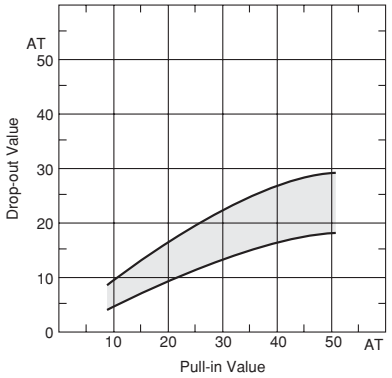
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

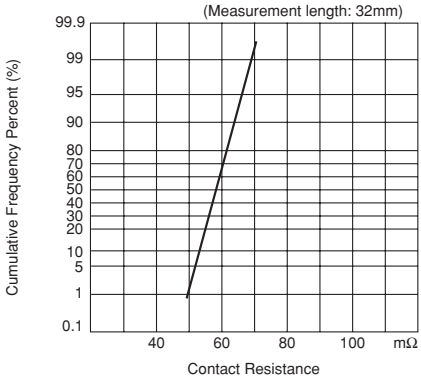
Parameter	Rated Value	Unit
Pull-in Value (PI)	10～40	AT
Drop-out Value (DO)	5min	AT
Contact Resistance (CR)	100max	mΩ
Breakdown Voltage	200 min (PI≧20)	VDC
	150 min (10≦PI＜20)	VDC
Insulation Resistance	10^9min	Ω
Electrostatic Capacitance	0.3max	pF
Contact Rating	10	VA
Maximum Switching Voltage	100 $\left(\begin{smallmatrix}DC\\AC\end{smallmatrix}\right)$	V
Maximum Switching Current	0.5	A
Maximum Carry Current	1.0	A

3

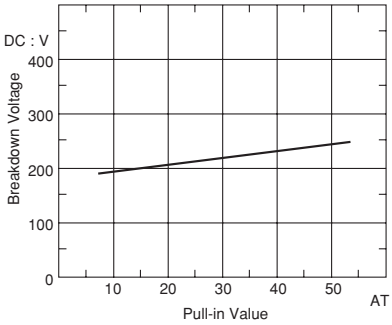
(1) Pull-in Value vs. Drop-out Value



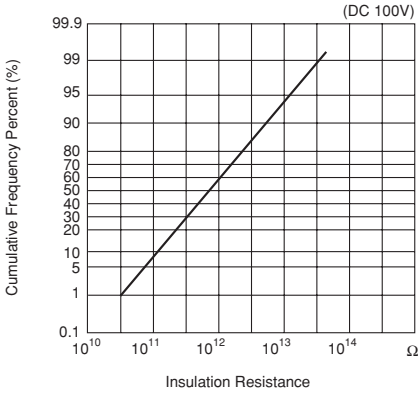
(2) Contact Resistance



(3) Breakdown Voltage

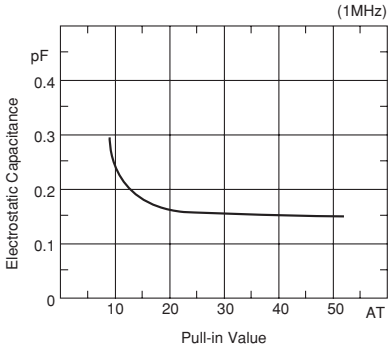


(4) Insulation Resistance



3

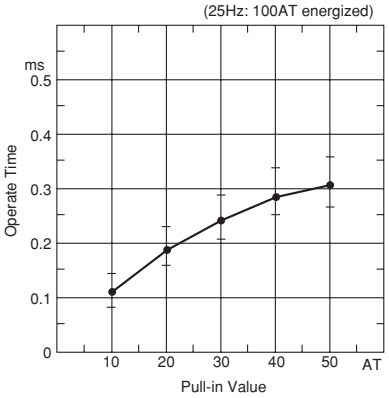
(5) Electrostatic Capacitance



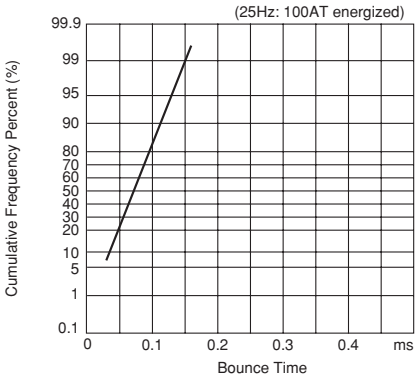
■ OPERATING CHARACTERISTICS

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

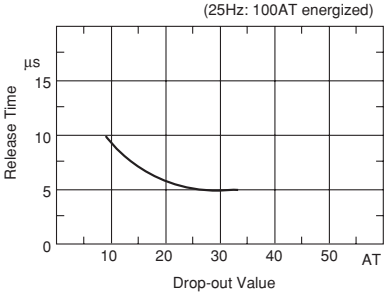
(1) Operate Time



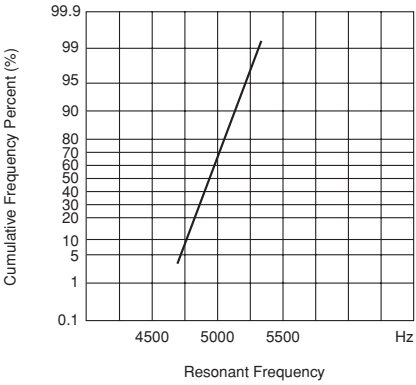
(2) Bounce Time



(3) Release Time

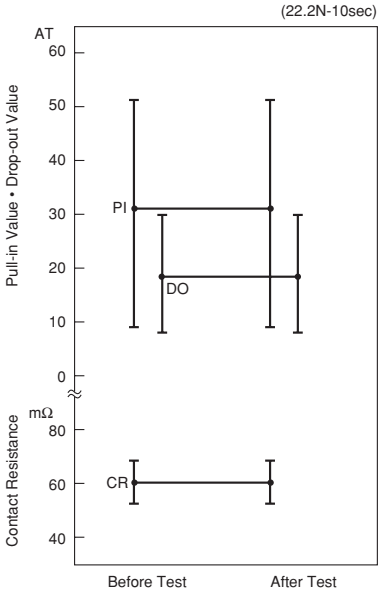


(4) Resonant Frequency

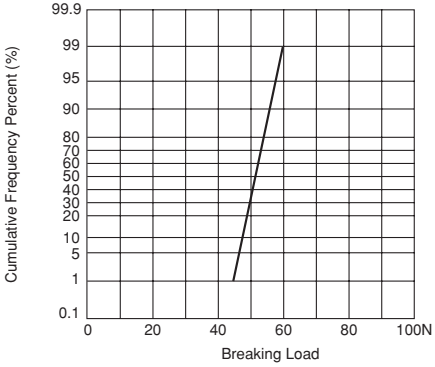


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (Static Load)

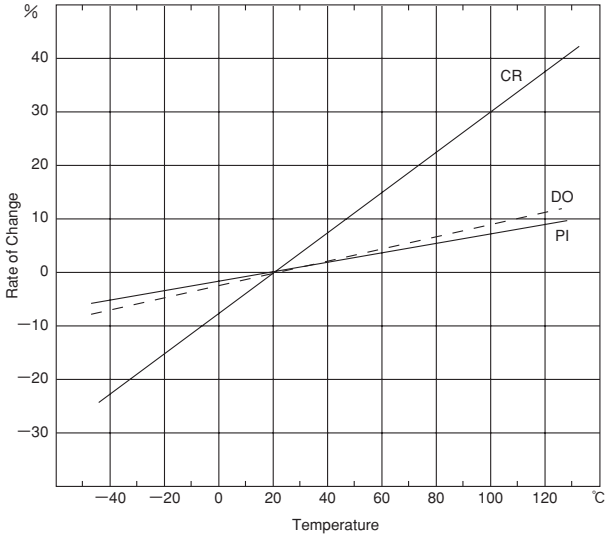


(2) Lead Tensile Strength



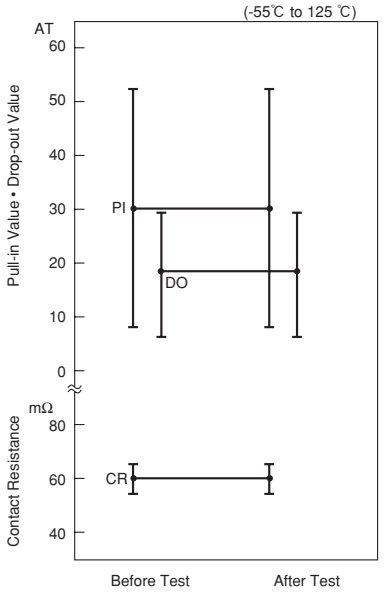
■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature Characteristics

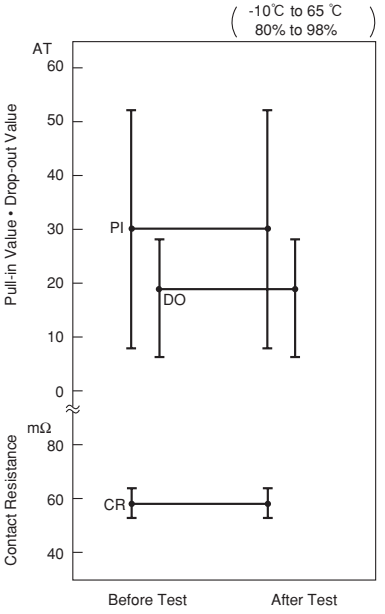


3

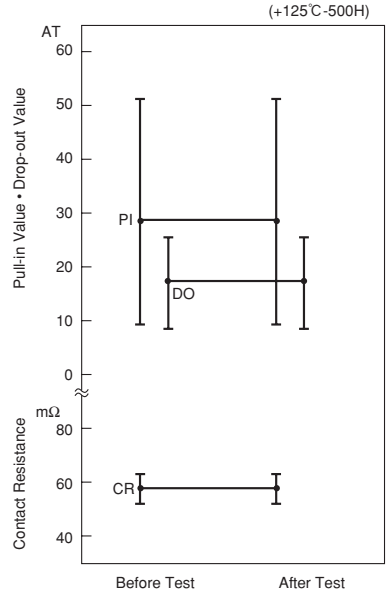
(2) Temperature Cycle



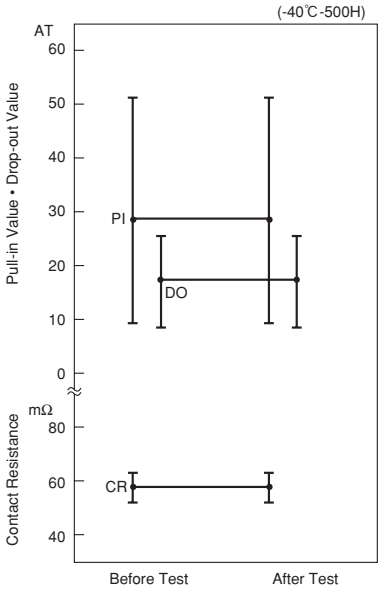
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

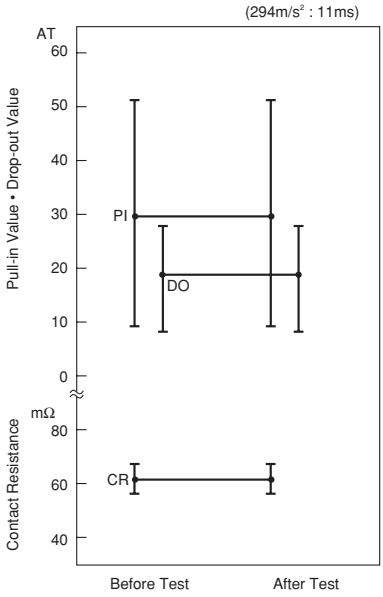


(5) Low Temperature Storage Test

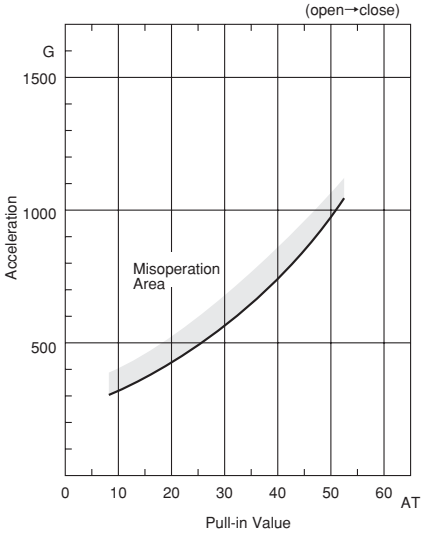


(6) Shock Test

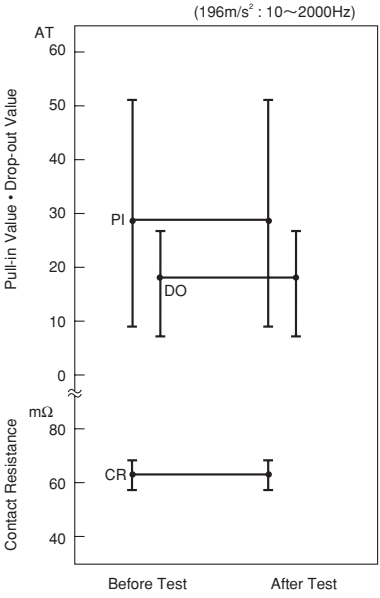
1) Electrical Characteristics



2) Misoperation Area



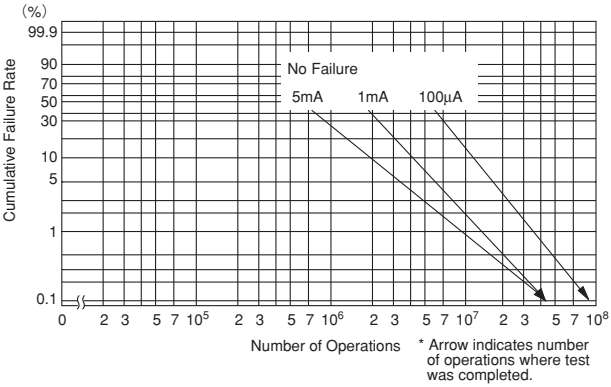
(7) Vibration Test



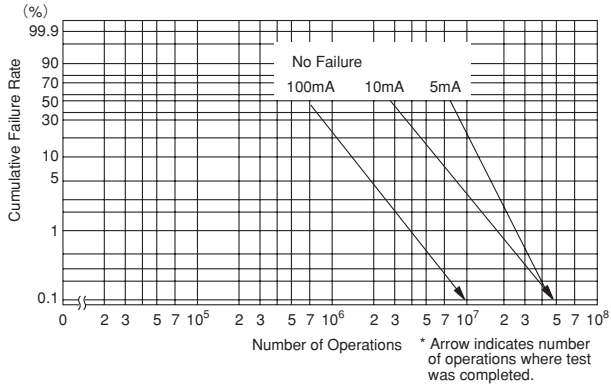
3

■ LIFE EXPECTANCY DATA: ORD228VL

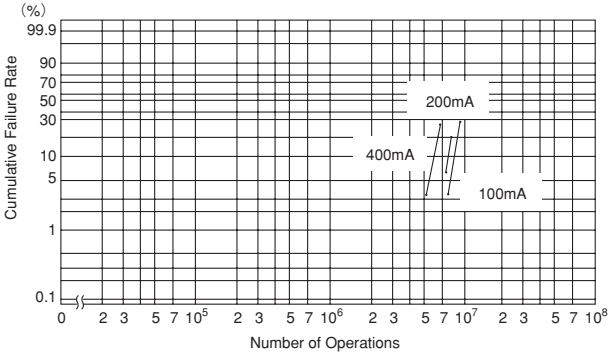
Load Conditions
Voltage: 5VDC
Current: 100μA, 1mA, 5mA
Load: Resistive Load



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



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



REED SWITCH

ORD324

General purpose miniature-type

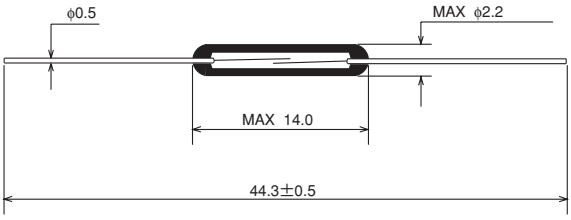
■ GENERAL DESCRIPTION

The ORD324 is a small single-contact reed switch designed for general control of medium level loads less than 200V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

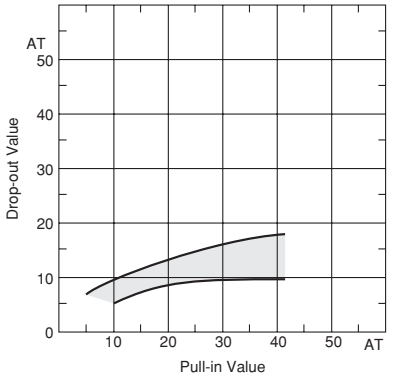
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

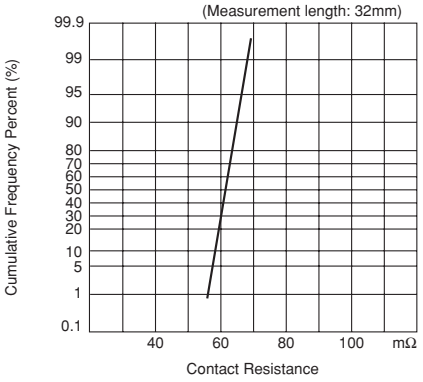
Parameter	Rated Value	Unit
Pull-in Value (PI)	10～40	AT
Drop-out Value (DO)	4min	AT
Contact Resistance (CR)	100max	mΩ
Breakdown Voltage	250 min	VDC
Insulation Resistance	10^{10}min	Ω
Electrostatic Capacitance	0.3max	pF
Contact Rating	10	VA
Maximum Switching Voltage	200DC	V
	150AC	V
Maximum Switching Current	0.5	A
Maximum Carry Current	1.0	A

3

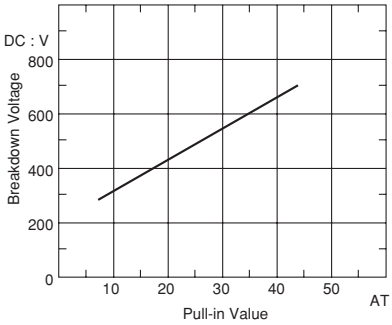
(1) Pull-in Value vs. Drop-out Value



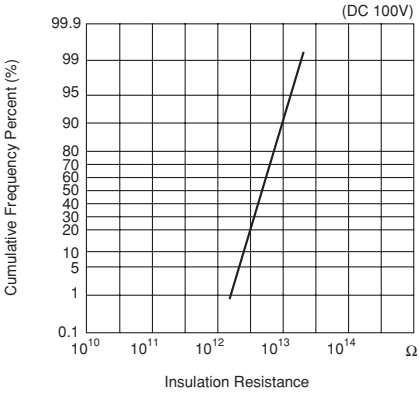
(2) Contact Resistance



(3) Breakdown Voltage

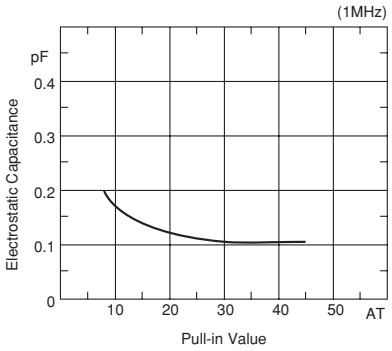


(4) Insulation Resistance



3

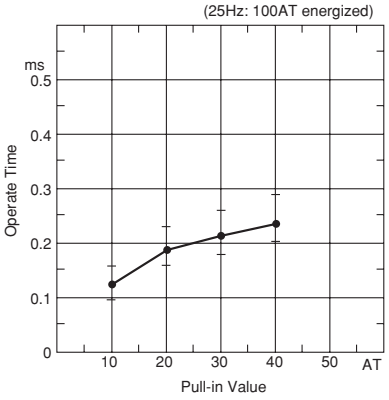
(5) Electrostatic Capacitance



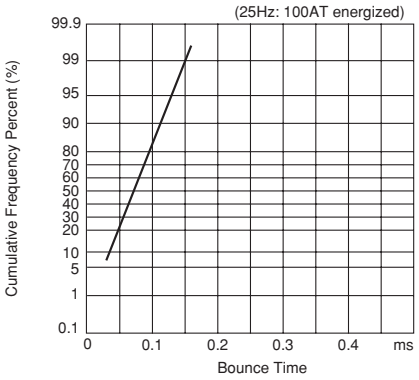
■ OPERATING CHARACTERISTICS

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

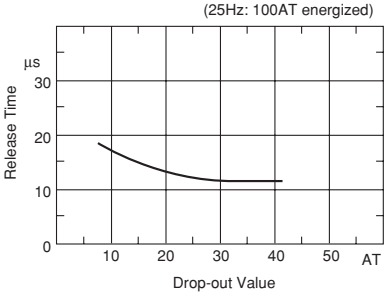
(1) Operate Time



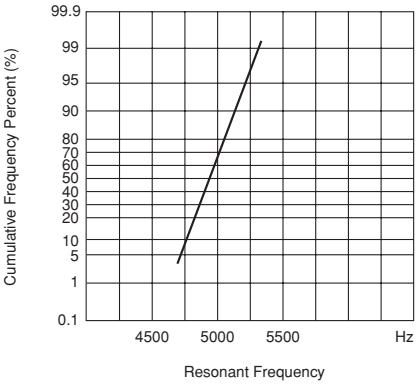
(2) Bounce Time



(3) Release Time

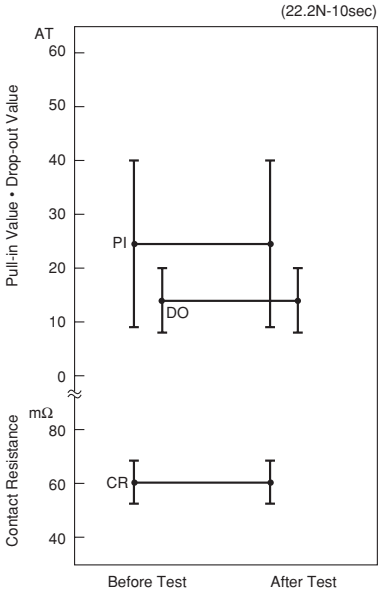


(4) Resonant Frequency

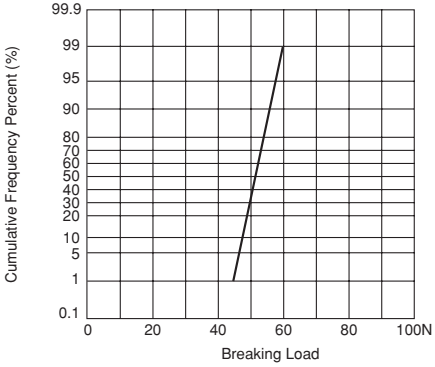


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (Static Load)

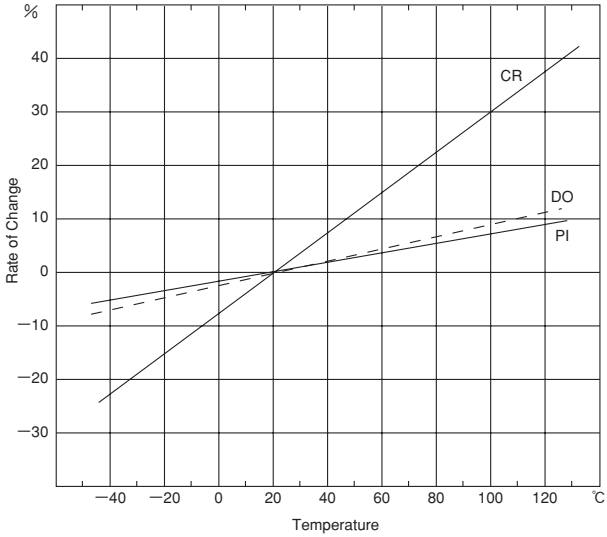


(2) Lead Tensile Strength



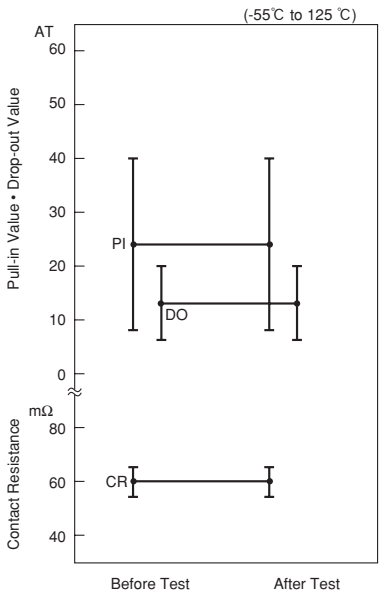
■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature Characteristics

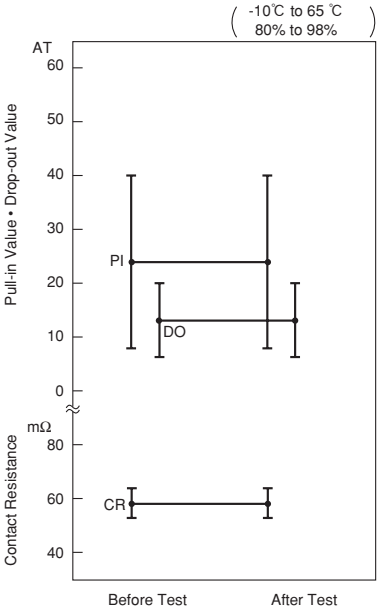


3

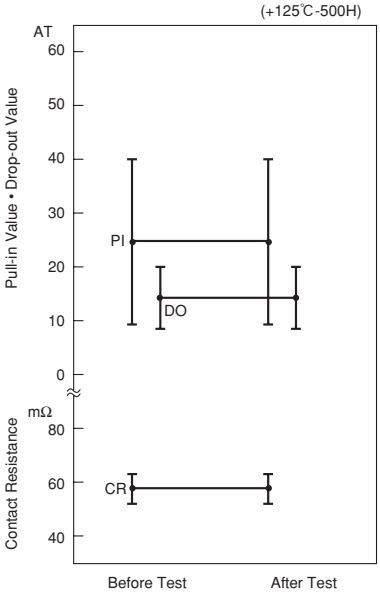
(2) Temperature Cycle



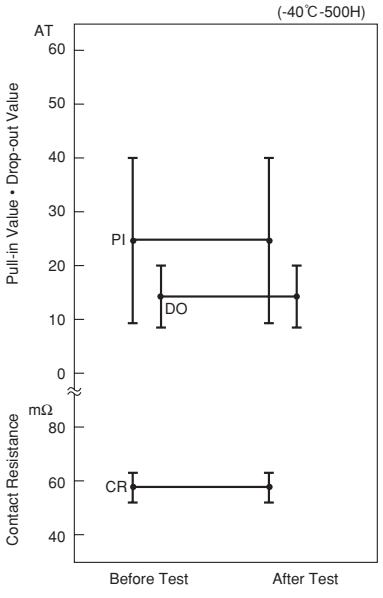
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

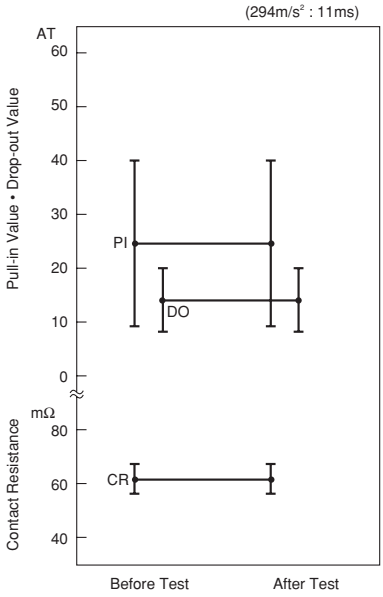


(5) Low Temperature Storage Test

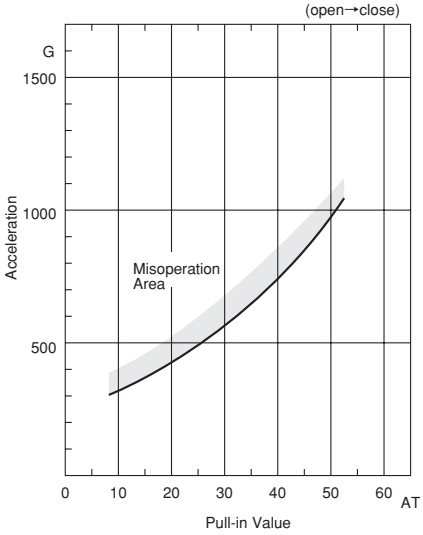


(6) Shock Test

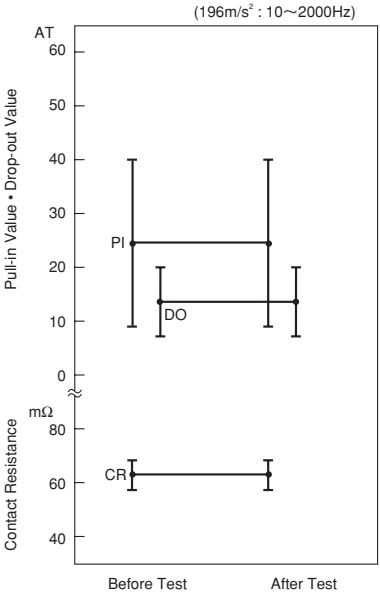
1) Electrical Characteristics



2) Misoperation Area



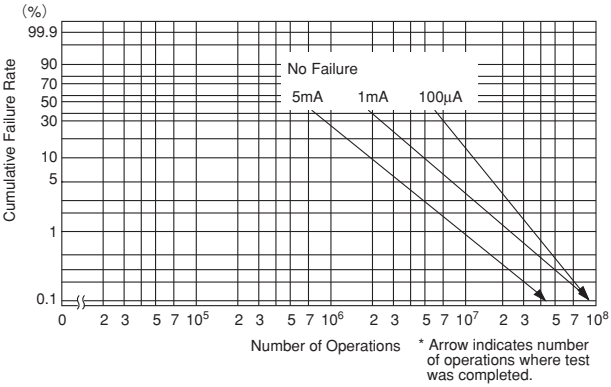
(7) Vibration Test



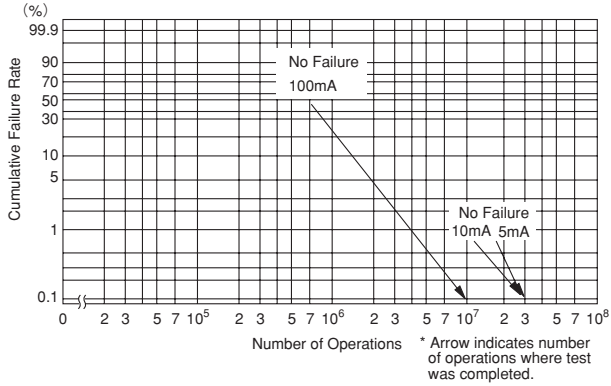
3

■ LIFE EXPECTANCY DATA: ORD324

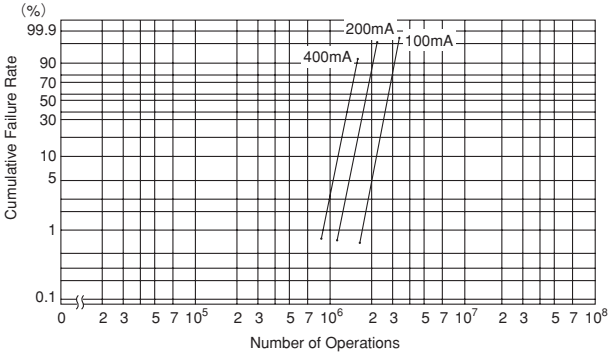
Load Conditions
Voltage: 5VDC
Current: 100μA, 1mA, 5mA
Load: Resistive Load



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



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



REED SWITCH

ORD324H

General purpose miniature-type, long lead

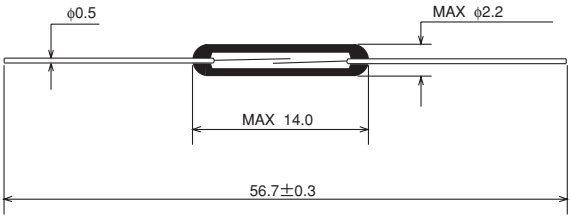
■ GENERAL DESCRIPTION

The ORD324H is a small single-contact reed switch designed for general control of low-level loads less than 200V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

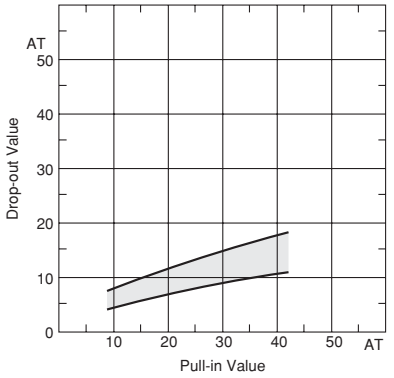
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

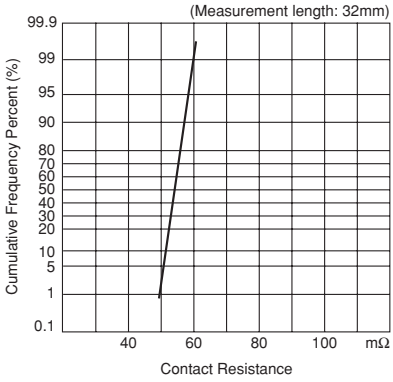
Parameter	Rated value	Unit
Pull-in Value (PI)	10～40	AT
Drop-out Value (DO)	3min	AT
Contact Resistance (CR)	100max	mΩ
Breakdown Voltage	250min	VDC
Insulation Resistance	10^{10}min	Ω
Electrostatic Capacitance	0.3max	pF
Contact Rating	10	VA
Maximum Switching Voltage	200DC	V
	150AC	V
Maximum Switching Current	0.5	A
Maximum Carry Current	1.0	A

3

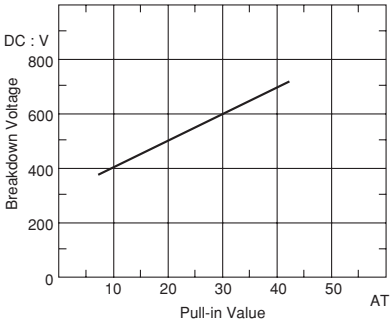
(1) Pull-in Value vs. Drop-out Value



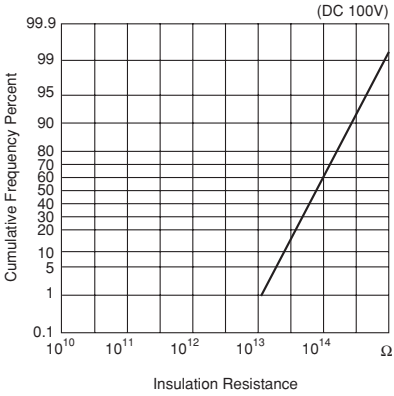
(2) Contact Resistance



(3) Breakdown Voltage

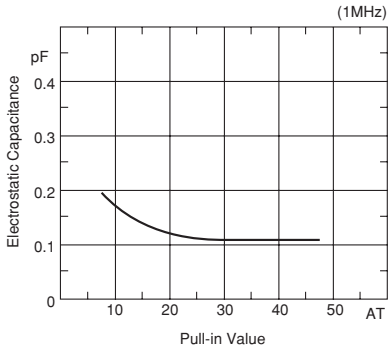


(4) Insulation Resistance



3

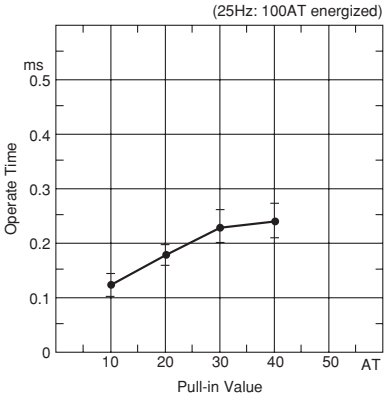
(5) Electrostatic Capacitance



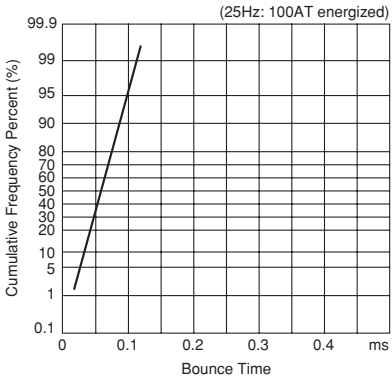
■ OPERATING CHARACTERISTICS

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

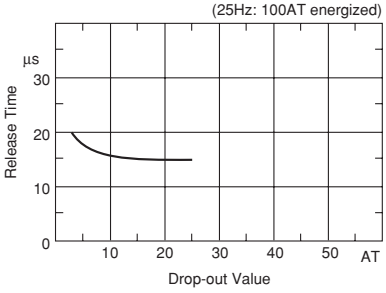
(1) Operate Time



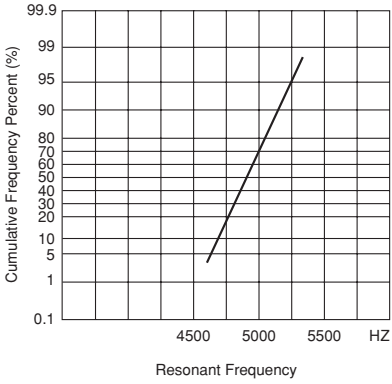
(2) Bounce Time



(3) Release Time

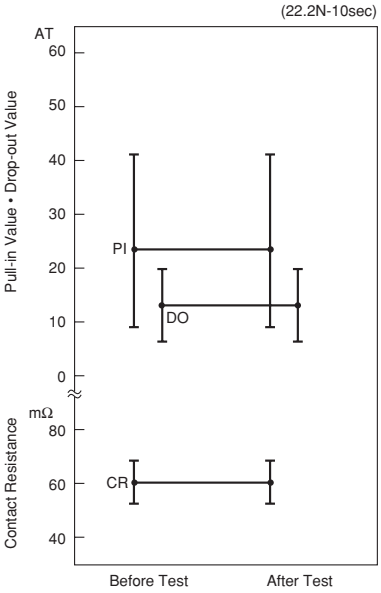


(4) Resonant Frequency

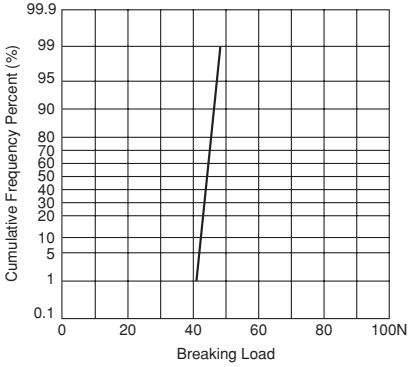


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (Static Load)

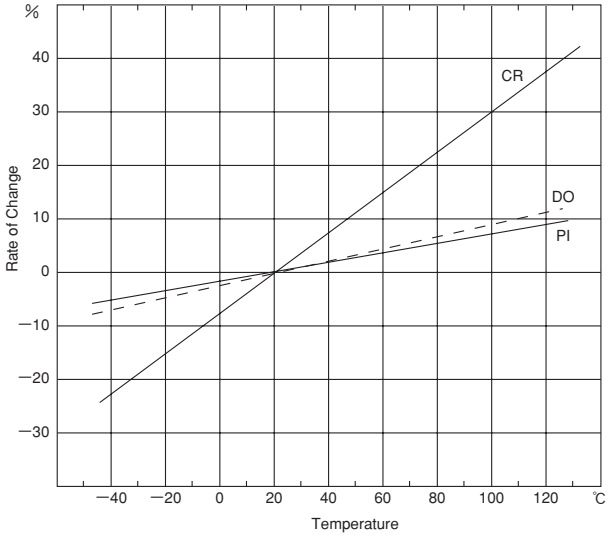


(2) Lead Tensile Strength



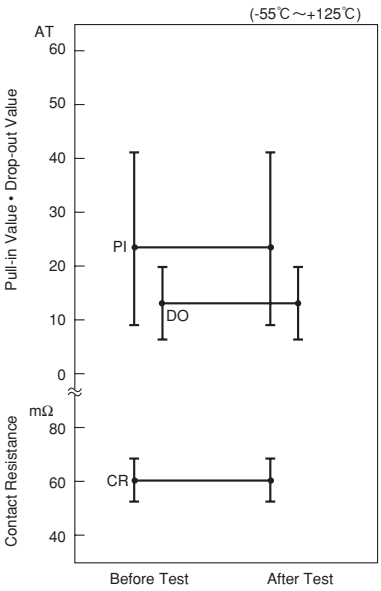
■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature Characteristics

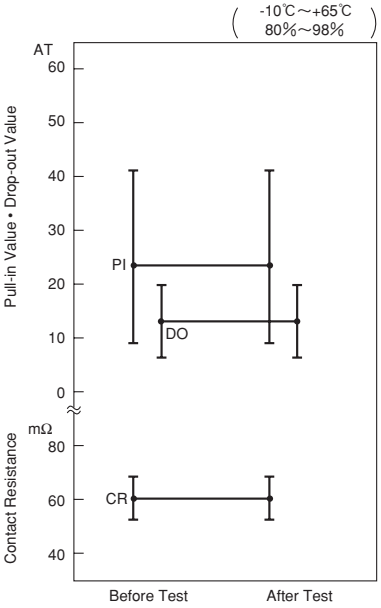


3

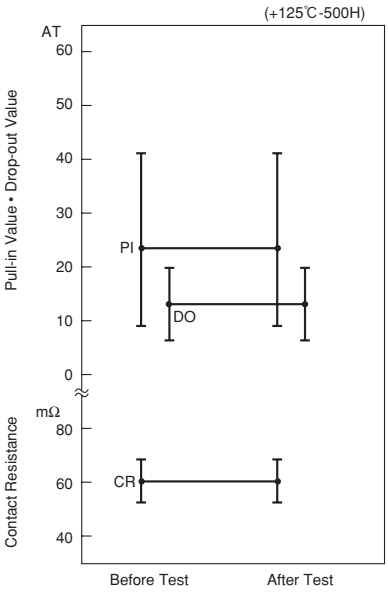
(2) Temperature Cycle



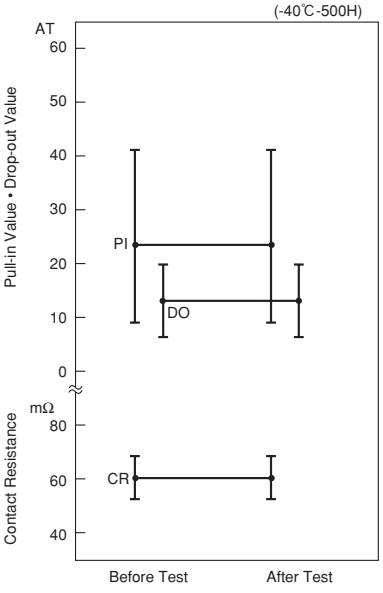
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

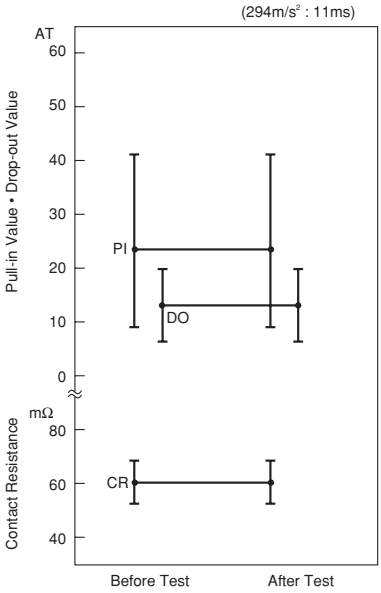


(5) Low Temperature Storage Test

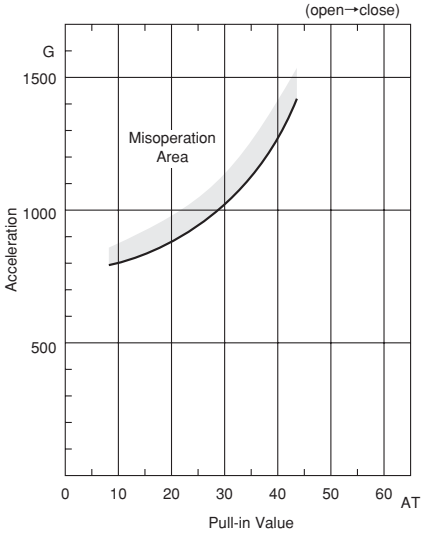


(6) Shock Test

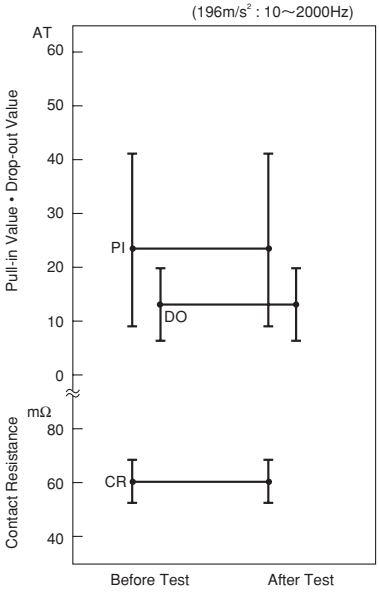
1) Electrical Characteristics



2) Misoperation Area



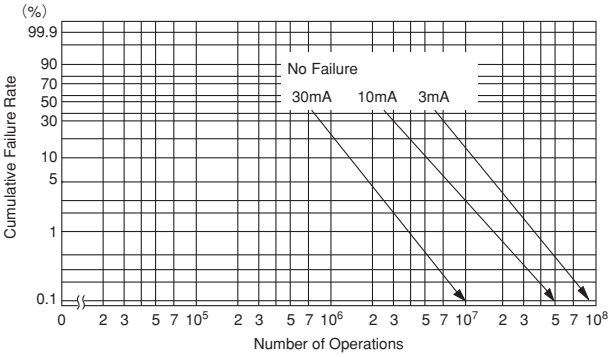
(7) Vibration Test



3

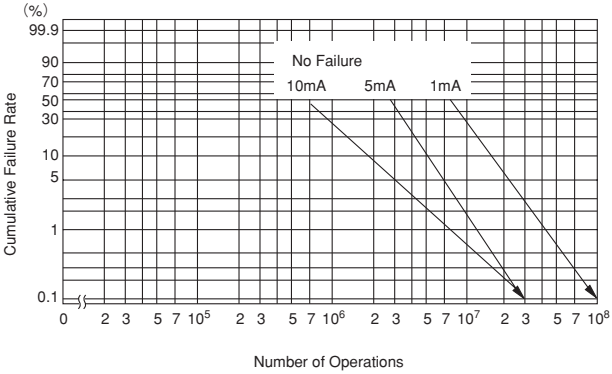
■ LIFE EXPECTANCY DATA: ORD324H

Load Conditions
Voltage: 3VDC
Current: 3mA, 10mA, 30mA
Load: Resistive Load

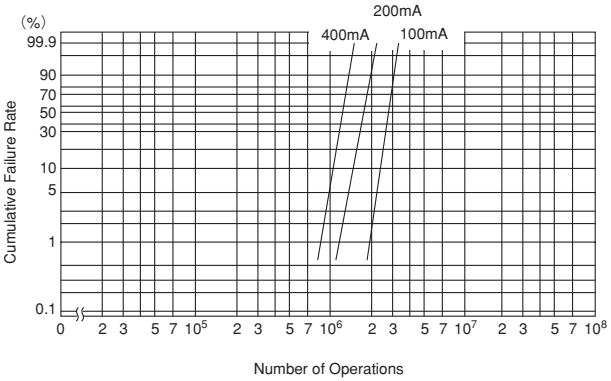


* Arrow indicates number of operations where test was completed.

Load Conditions
Voltage: 5VDC
Current: 1mA, 5mA, 10mA
Load: Resistive Load



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



REED SWITCH

ORD325

General purpose miniature-type

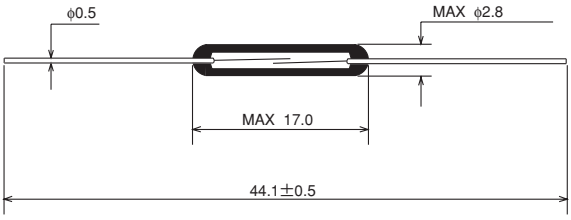
■ GENERAL DESCRIPTION

The ORD325 is a small single-contact reed switch designed for general control of medium-level loads less than 200V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



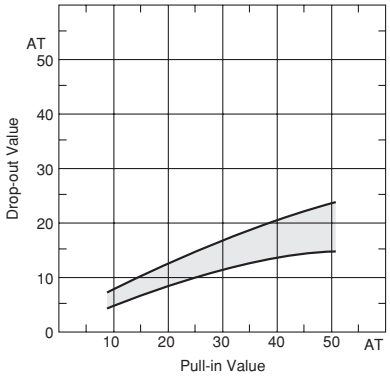
■ APPLICATIONS

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

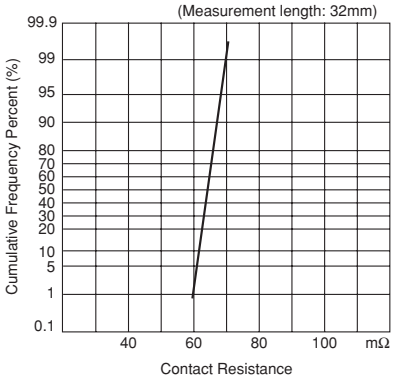
■ ELECTRICAL CHARACTERISTICS

Parameter	Rated Value	Unit
Pull-in Value (PI)	10～50	AT
Drop-out Value (DO)	4min	AT
Contact Resistance (CR)	100max	mΩ
Breakdown Voltage	300min (PI≧15)	VDC
	250min (PI＜15)	VDC
Insulation Resistance	10^{10}min	Ω
Electrostatic Capacitance	0.3max	pF
Contact Rating	10	VA
Maximum Switching Voltage	200DC	V
	150AC	V
Maximum Switching Current	0.5	A
Maximum Carry Current	1.0	A

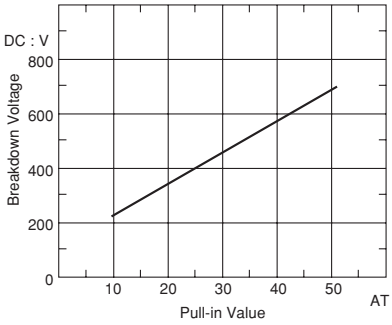
(1) Pull-in Value vs. Drop-out Value



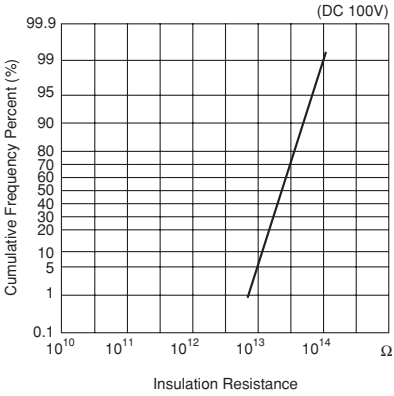
(2) Contact Resistance



(3) Breakdown Voltage

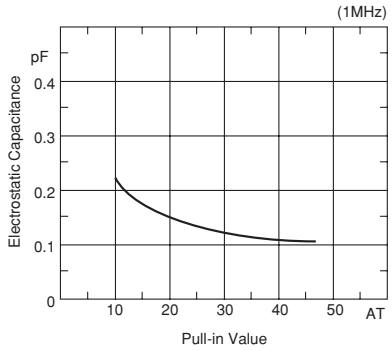


(4) Insulation Resistance



3

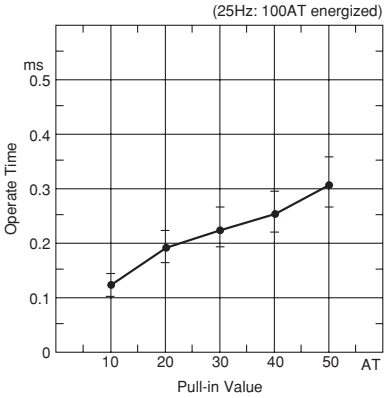
(5) Electrostatic Capacitance



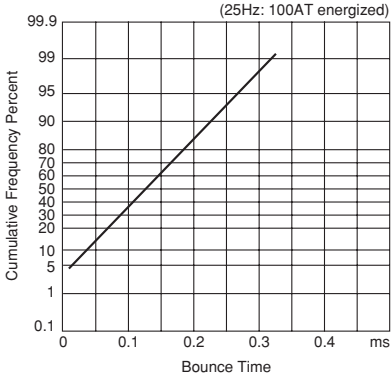
■ OPERATING CHARACTERISTICS

Parameter	Rated Value	Unit
Operate Time	0.4max	ms
Bounce Time	0.4max	ms
Release Time	0.05max	ms
Resonant Frequency	3700±300	Hz
Maximum Operating Frequency	500	Hz

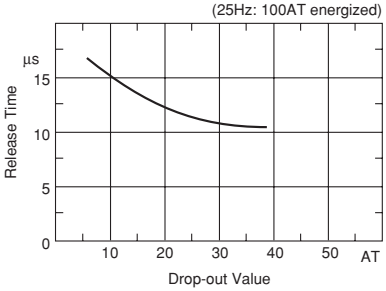
(1) Operate Time



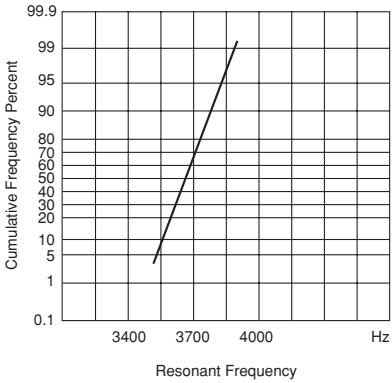
(2) Bounce Time



(3) Release Time

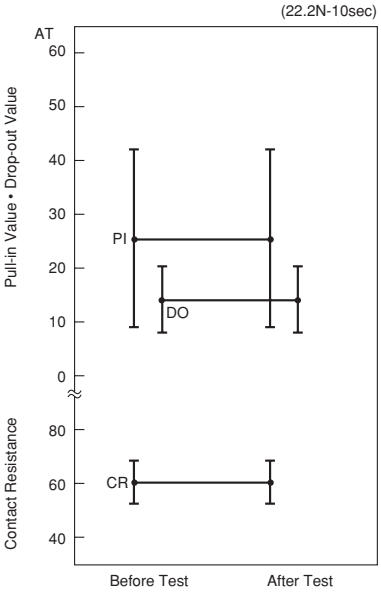


(4) Resonant Frequency

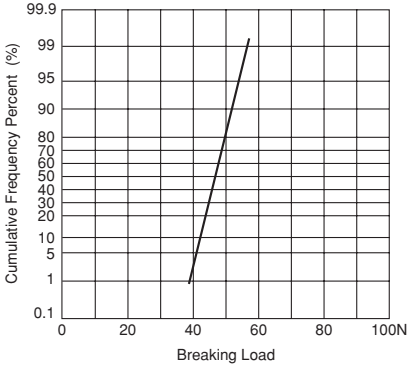


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (Static Load)

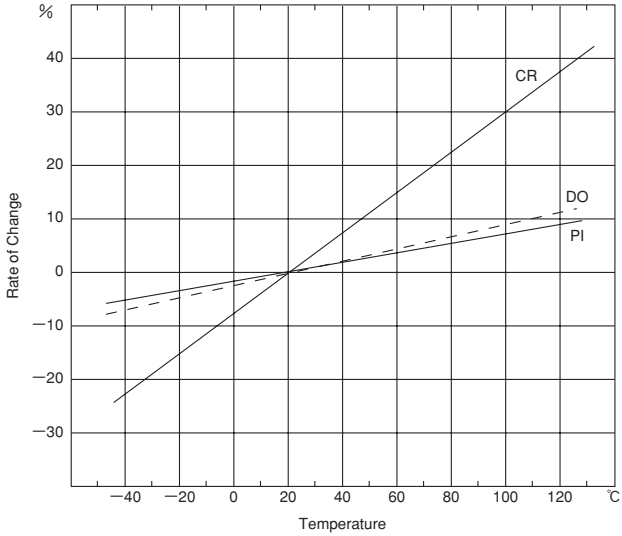


(2) Lead Tensile Strength



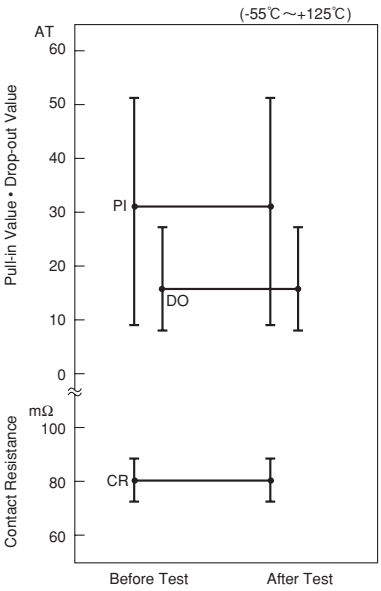
■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature Characteristics

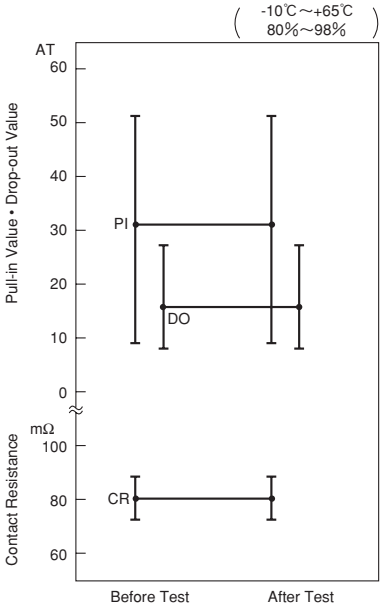


3

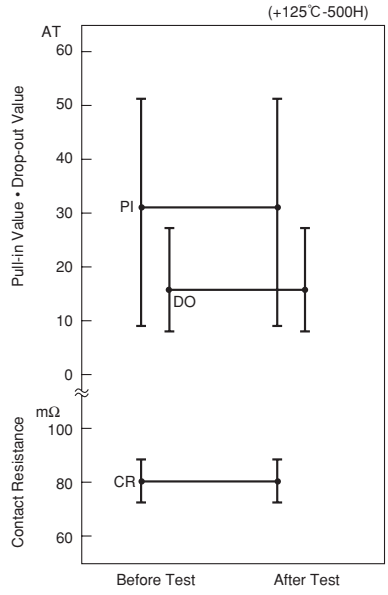
(2) Temperature Cycle



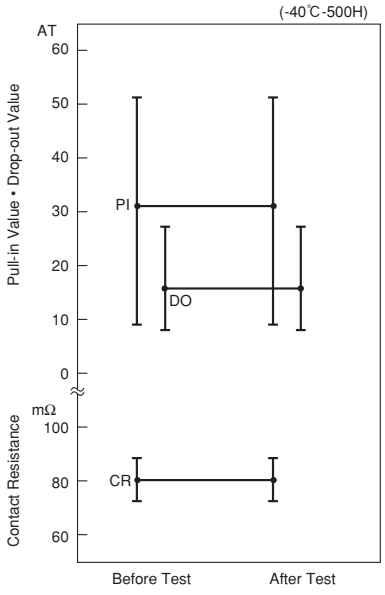
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

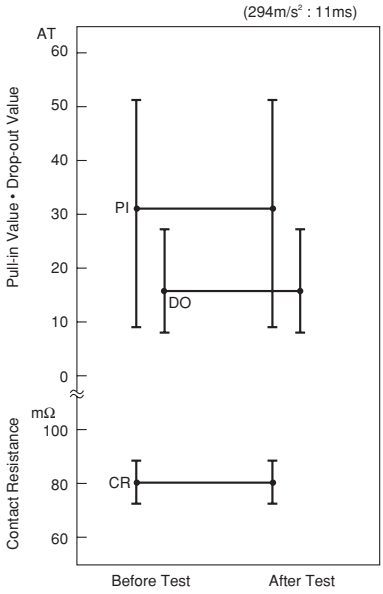


(5) Low Temperature Storage Test

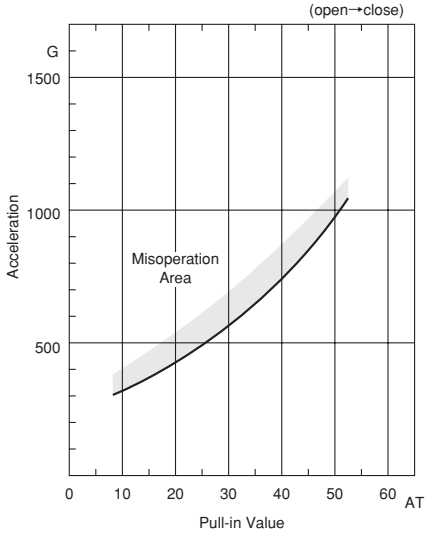


(6) Shock Test

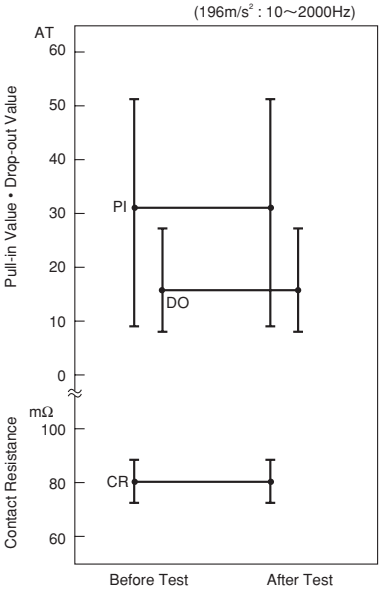
1) Electrical Characteristics



2) Misoperation Area



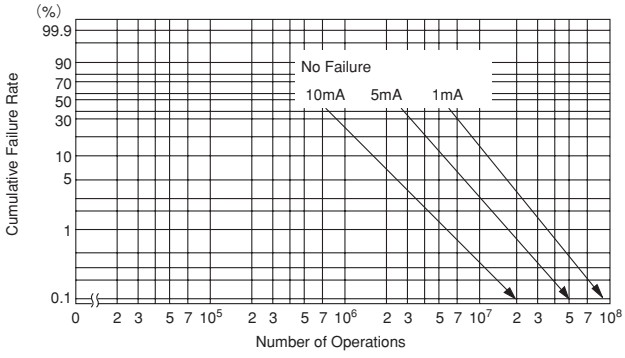
(7) Vibration Test



3

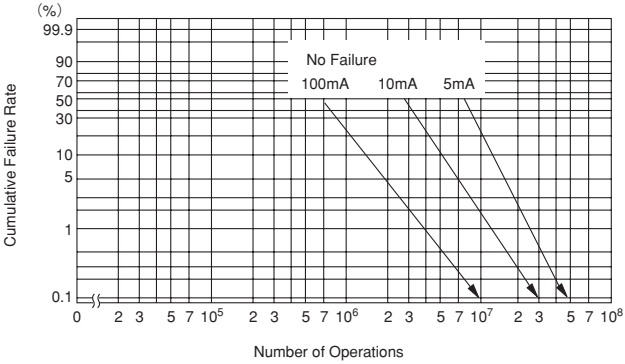
■ LIFE EXPECTANCY DATA: ORD325

Load Conditions
Voltage: 5VDC
Current: 1mA, 5mA, 10mA
Load: Resistive Load



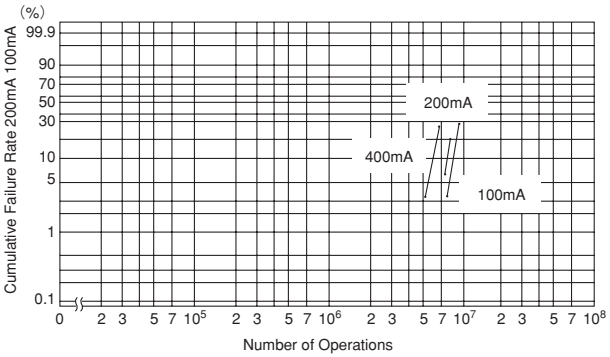
* Arrow indicates number of operations where test was completed.

Load Conditions
Voltage: 12 VDC
Current: 5mA, 12mA, 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

ORD229

High breakdown voltage

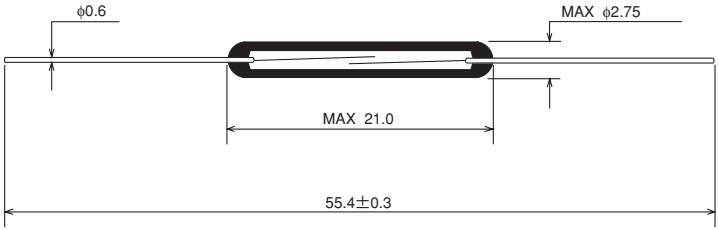
■ GENERAL DESCRIPTION

The ORD229 is a single-contact, high power reed switch (70VA AC or 50W DC) designed for high breakdown voltages up to 600V DC.

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



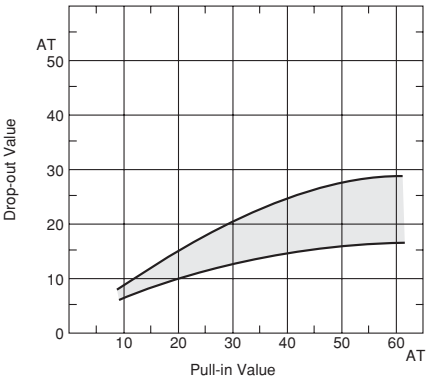
■ APPLICATIONS

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

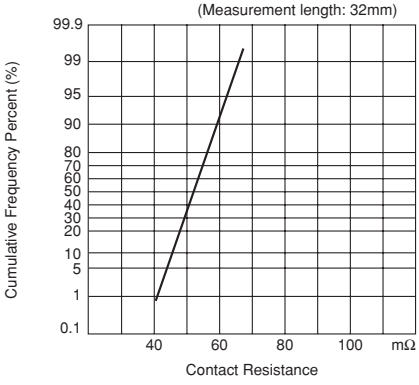
■ ELECTRICAL CHARACTERISTICS

Parameter	Rated Value	Unit
Pull-in Value (PI)	20～60	AT
Drop-out Value (DO)	6min	AT
Contact Resistance (CR)	100max	mΩ
Breakdown Voltage	600 min (PI≧35)	VDC
	500 min (20≦PI＜35)	VDC
Insulation Resistance	10^{10}min	Ω
Electrostatic Capacitance	0.5max	pF
Contact Rating	50DC	W
	70AC	VA
Maximum Switching Voltage	350DC	V
	300AC	V
Maximum Switching Current	DC0.7	A
	AC0.5	A
Maximum Carry Current	2.5	A

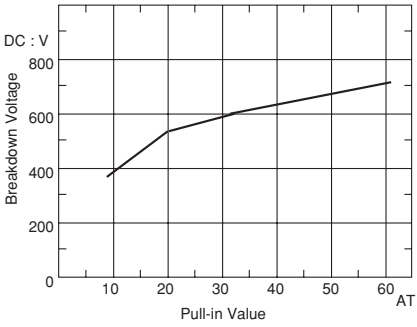
(1) Pull-in Value vs. Drop-out Value



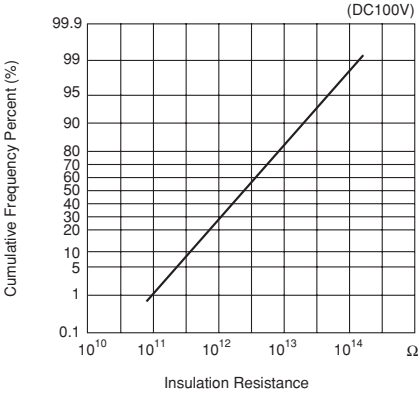
(2) Contact Resistance



(3) Breakdown Voltage

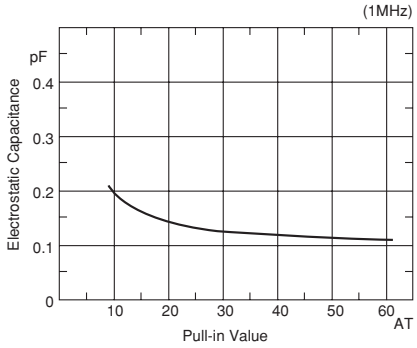


(4) Insulation Resistance



3

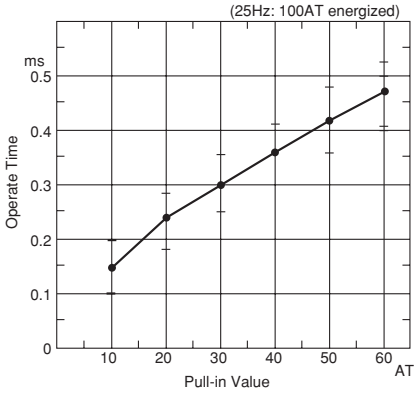
(5) Electrostatic Capacitance



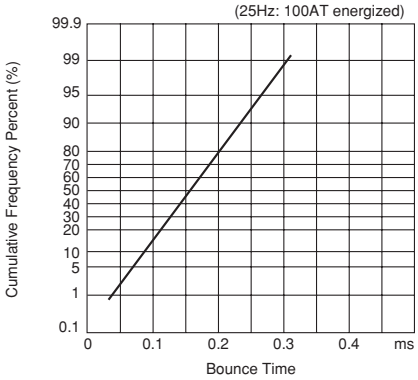
■ OPERATING CHARACTERISTICS

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

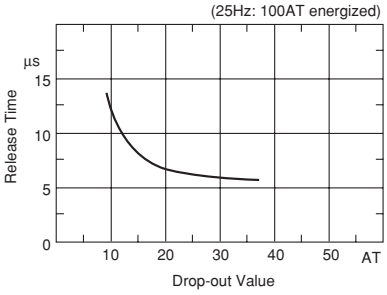
(1) Operate Time



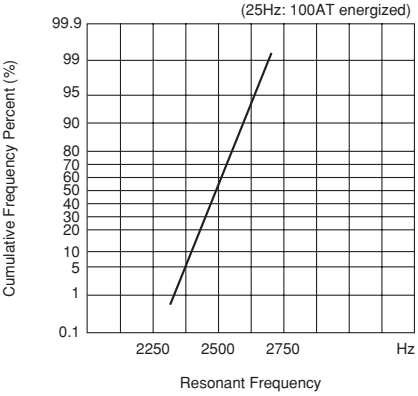
(2) Bounce Time



(3) Release Time

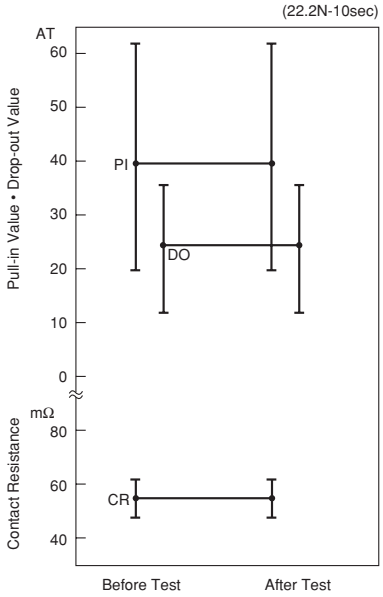


(4) Resonant Frequency

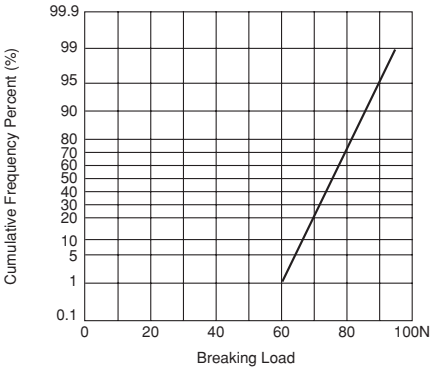


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (Static Load)

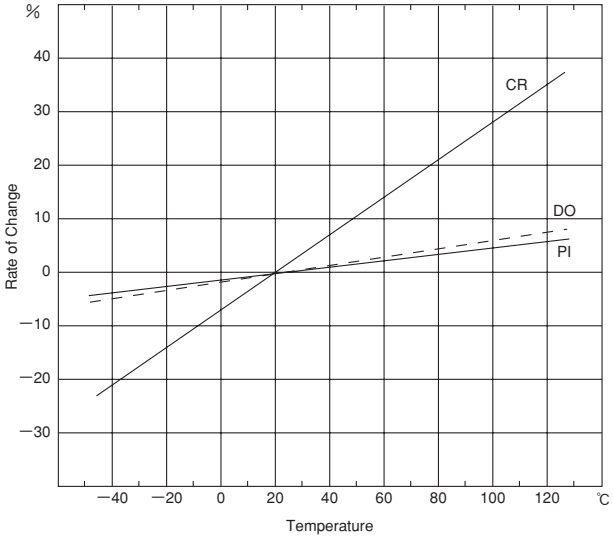


(2) Lead Tensile Strength



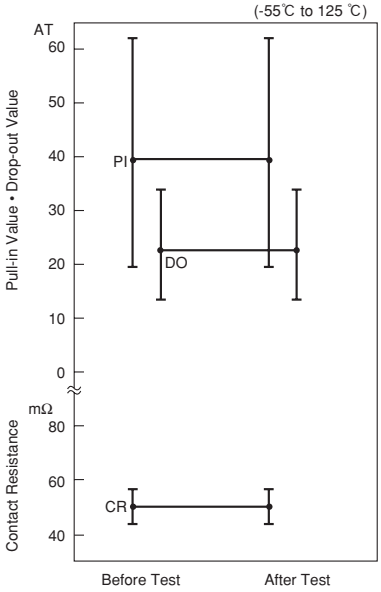
■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature Characteristics

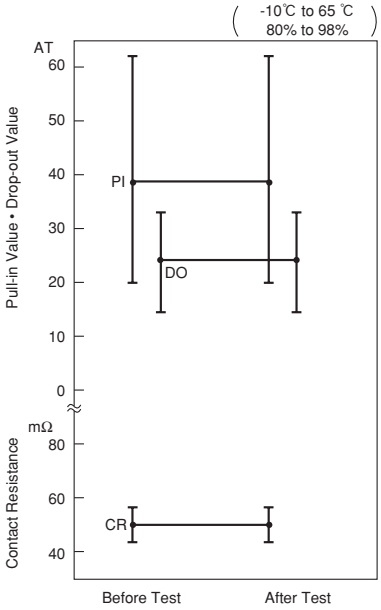


3

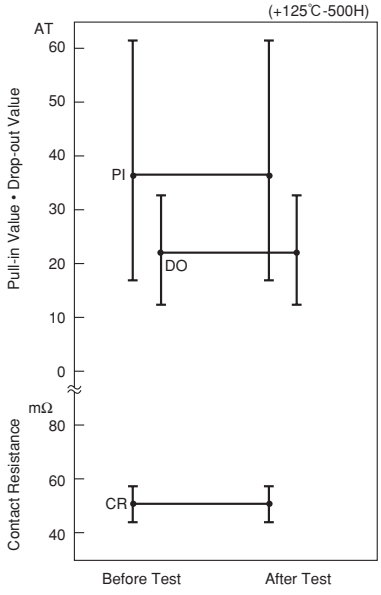
(2) Temperature Cycle



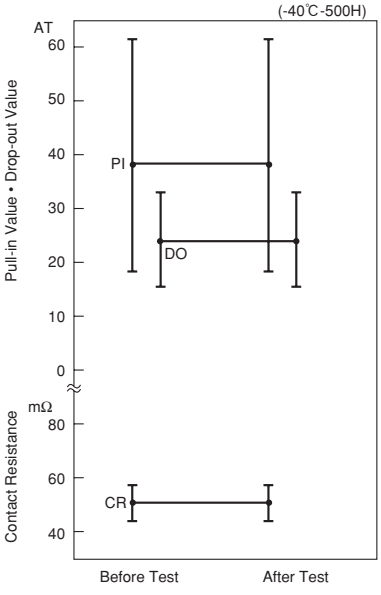
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

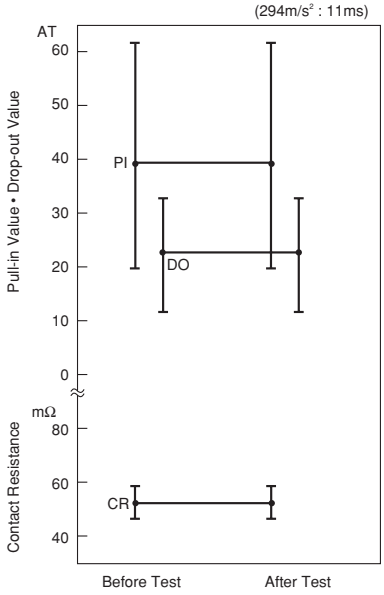


(5) Low Temperature Storage Test

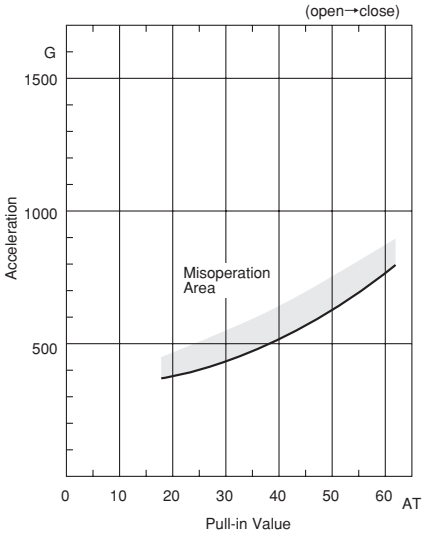


(6) Shock Test

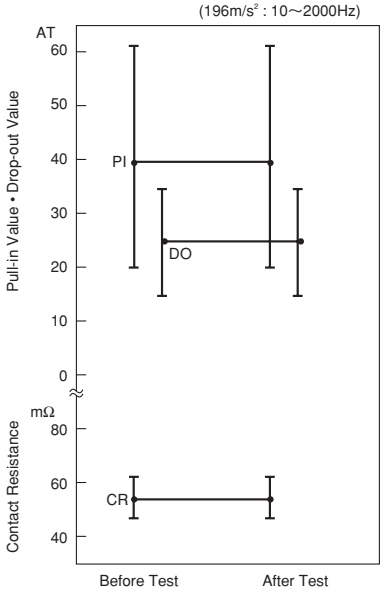
1) Electrical Characteristics



2) Misoperation Area



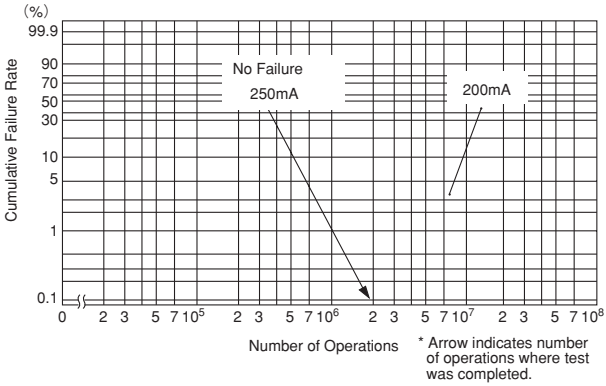
(7) Vibration Test



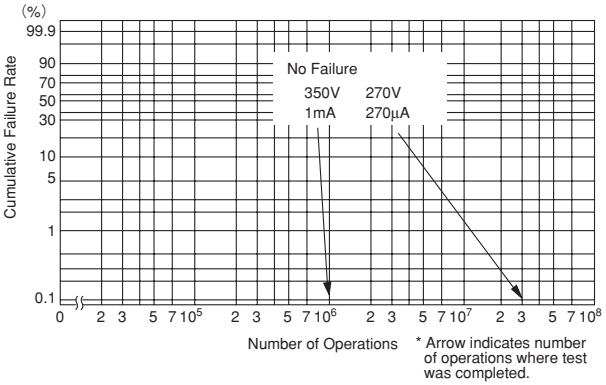
3

■ LIFE EXPECTANCY DATA: ORD229

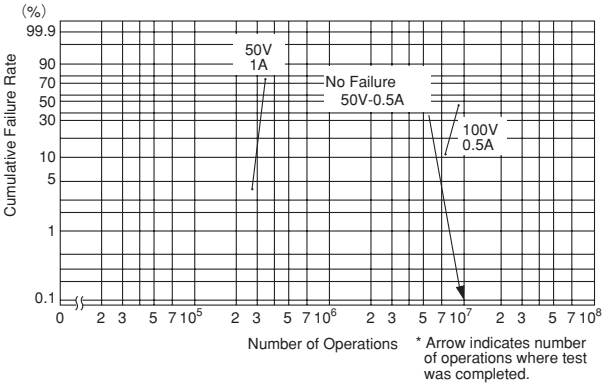
Load Conditions
Voltage: 200VAC
Current: 200mA, 250mA
Load: Resistive Load



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 SWTICH

ORD2210

High power

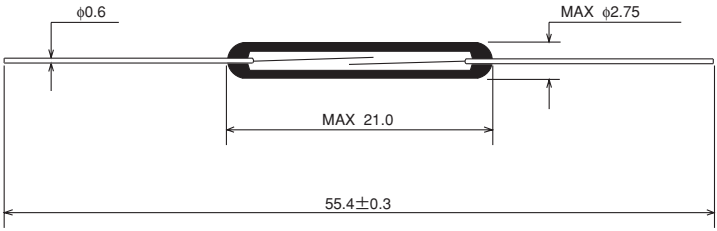
■ GENERAL DESCRIPTION

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

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



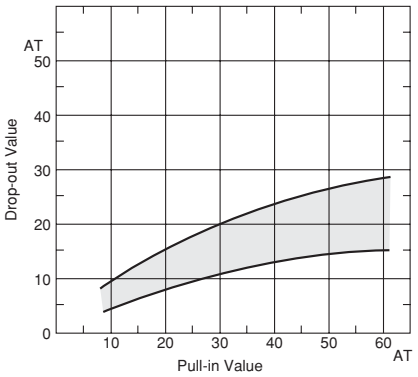
■ APPLICATIONS

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

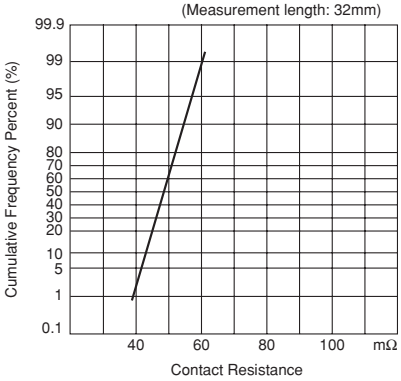
■ ELECTRICAL CHARACTERISTICS

Parameter	Rated Value	Unit
Pull-in Value (PI)	15～60	AT
Drop-out Value (DO)	7min	AT
Contact Resistance (CR)	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	50DC	W
	70AC	VA
Maximum Switching Voltage	200DC	V
	150AC	V
Maximum Switching Current	1.0DC	A
	0.7AC	A
Maximum Carry Current	2.5	A

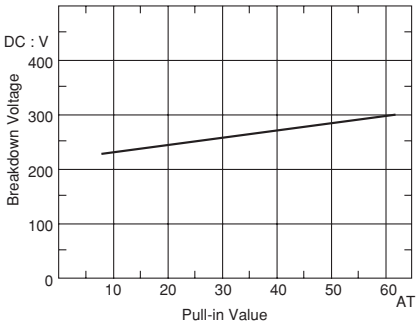
(1) Pull-in Value vs. Drop-out Value



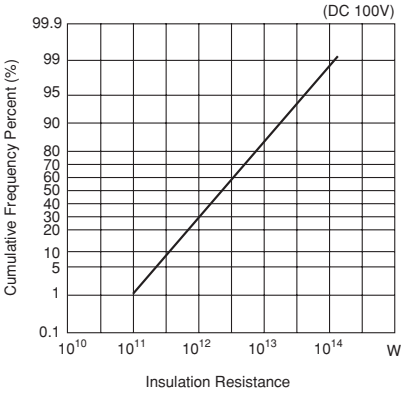
(2) Contact Resistance



(3) Breakdown Voltage

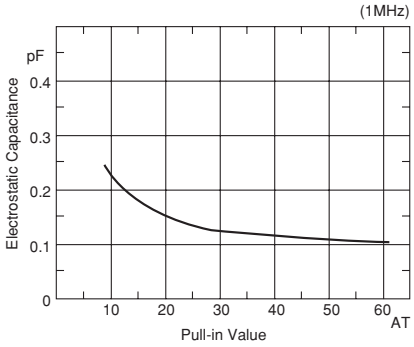


(4) Insulation Resistance



3

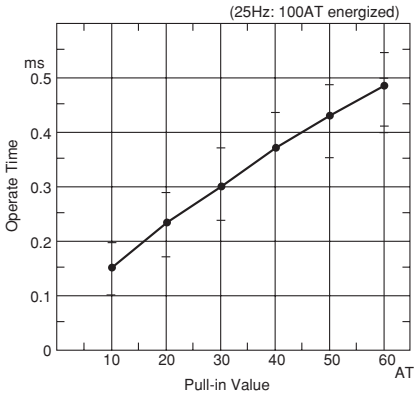
(5) Electrostatic Capacitance



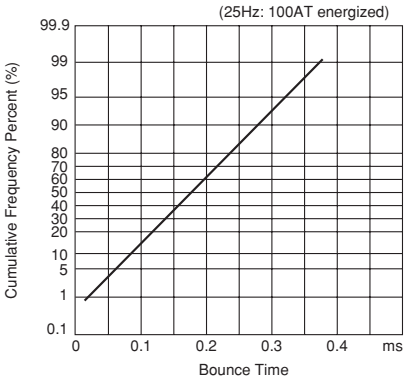
■ OPERATING CHARACTERISTICS

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

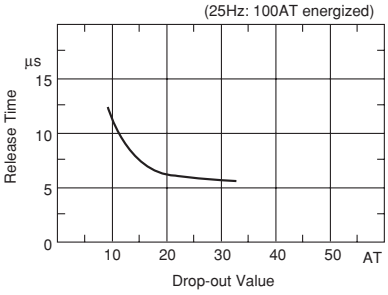
(1) Operate Time



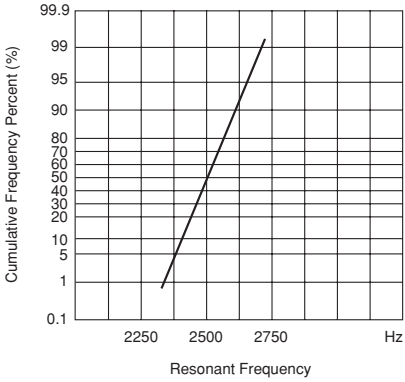
(2) Bounce Time



(3) Release Time

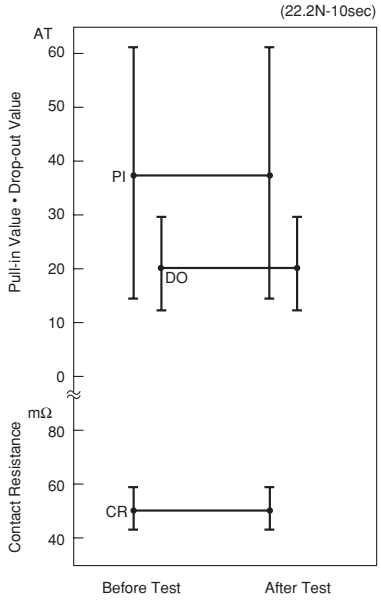


(4) Resonant Frequency

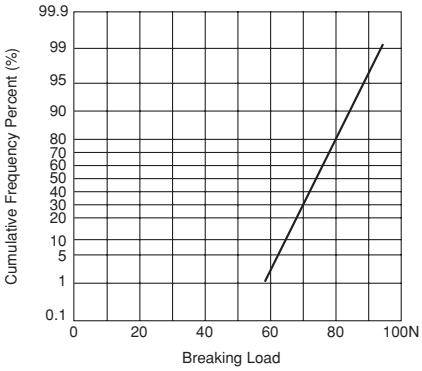


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (Static Load)

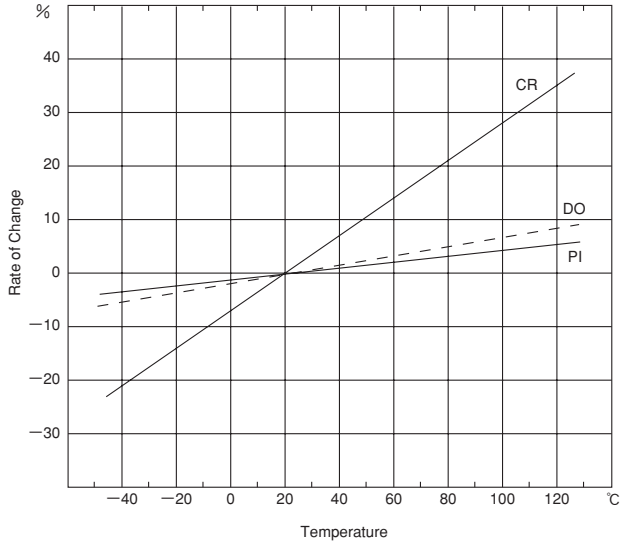


(2) Lead Tensile Strength



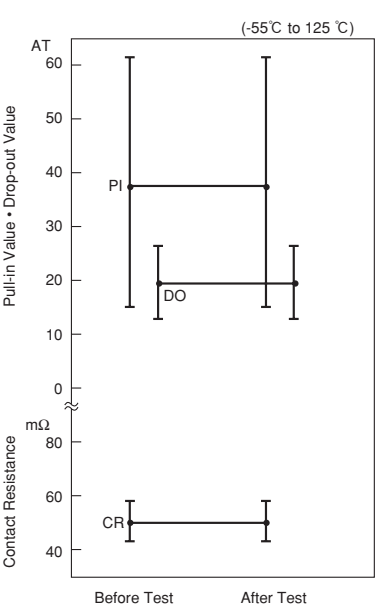
■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature Characteristics

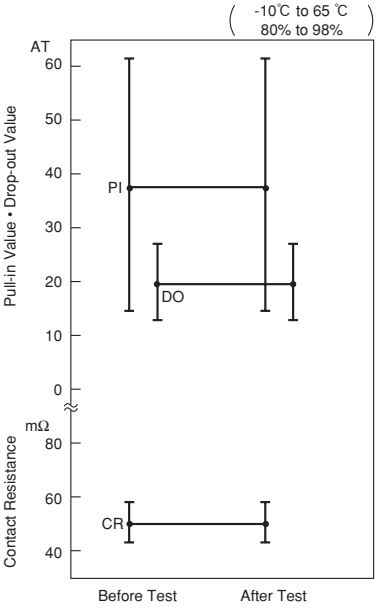


3

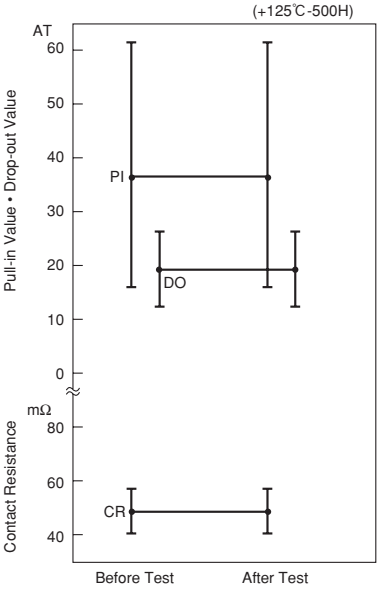
(2) Temperature Cycle



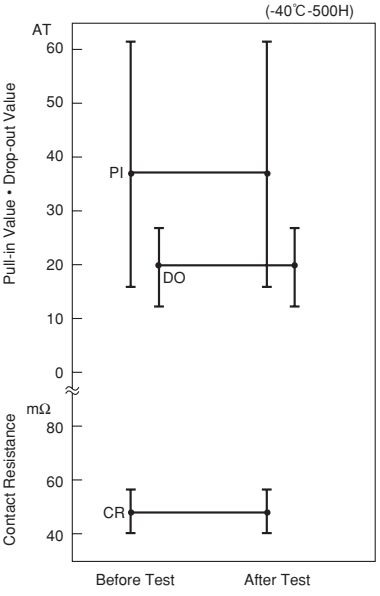
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

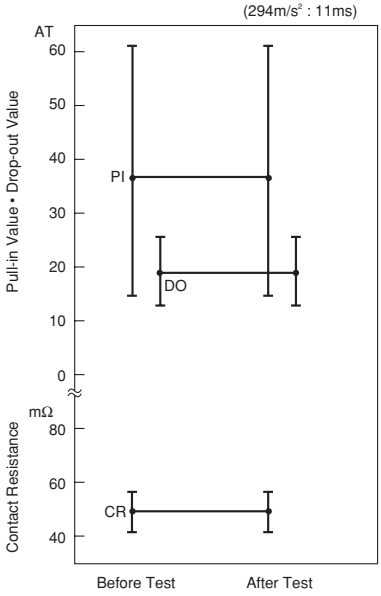


(5) Low Temperature Storage Test

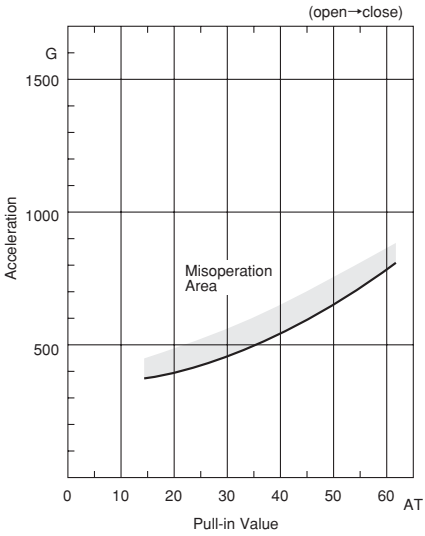


(6) Shock Test

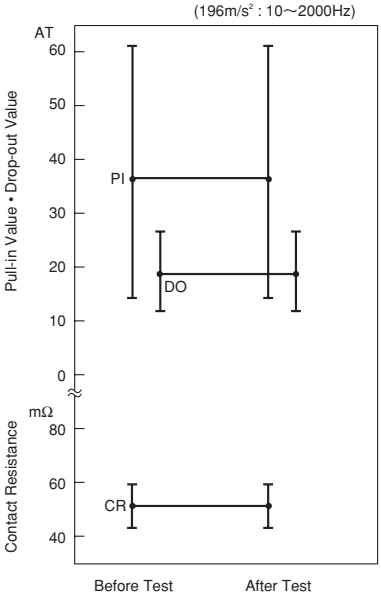
1) Electrical Characteristics



2) Misoperation Area



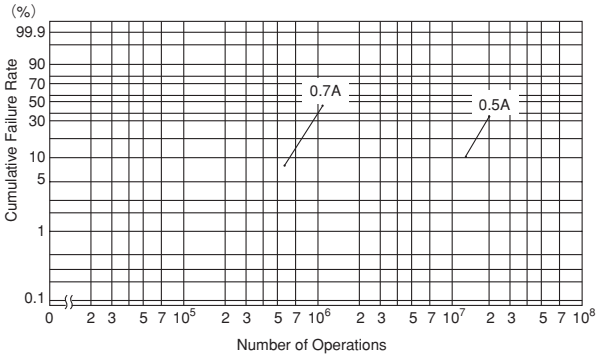
(7) Vibration Test



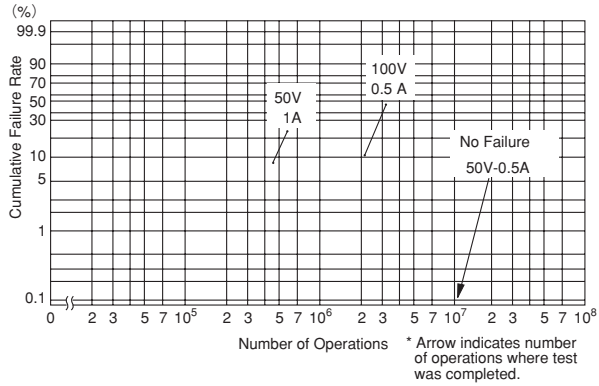
3

■ LIFE EXPECTANCY DATA: ORD2210

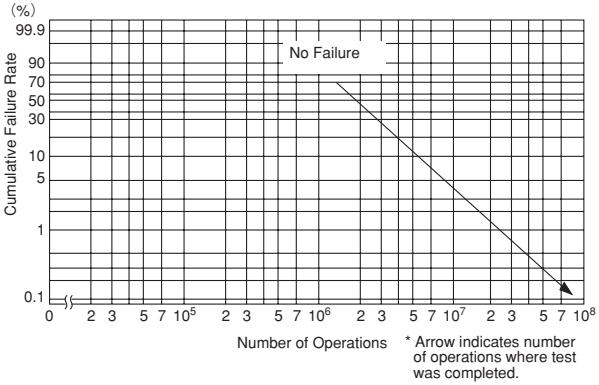
Load Conditions
Voltage: 100VAC
Current: 0.7A, 0.5A
Load: Resistive Load



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

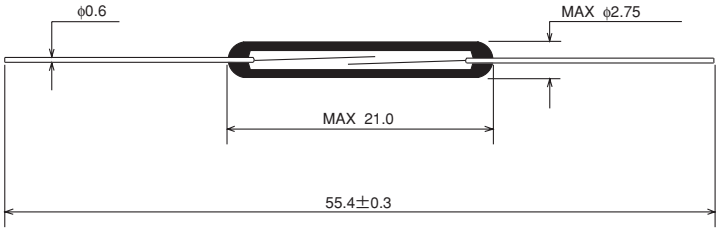
■ GENERAL DESCRIPTION

The ORD2210V is a vacuum type, small single-contact reed switch designed for ultra high breakdown voltages up to 1000V DC.

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

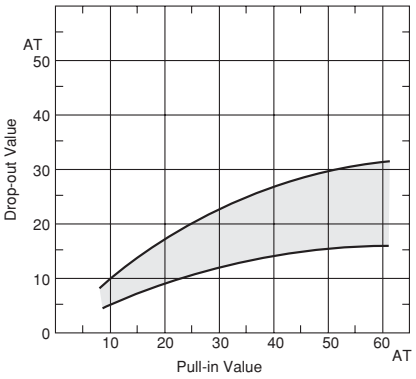
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

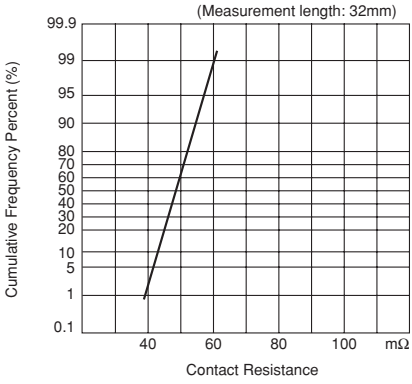
Parameter	Rated Value	Unit
Pull-in Value (PI)	20～60	AT
Drop-out Value (DO)	7min	AT
Contact Resistance (CR)	100max	mΩ
Breakdown Voltage	1000min	VDC
Insulation Resistance	10^{10}min	Ω
Electrostatic Capacitance	0.5max	pF
Maximum Switching Voltage	100	VA
	350DC	V
	300AC	V
Maximum Switching Current	1.0	A
Maximum Carry Current	2.5	A

3

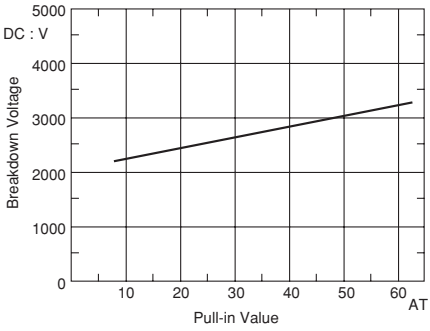
(1) Pull-in Value vs. Drop-out Value



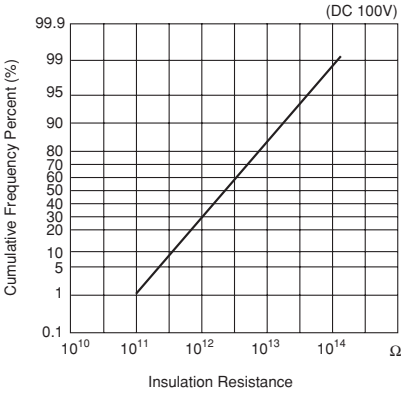
(2) Contact Resistance



(3) Breakdown Voltage

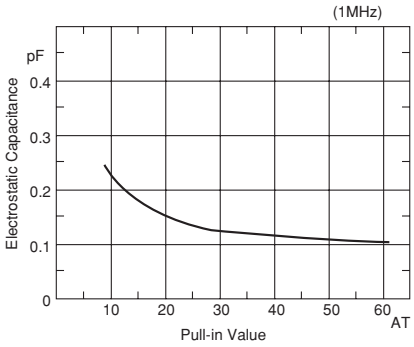


(4) Insulation Resistance



3

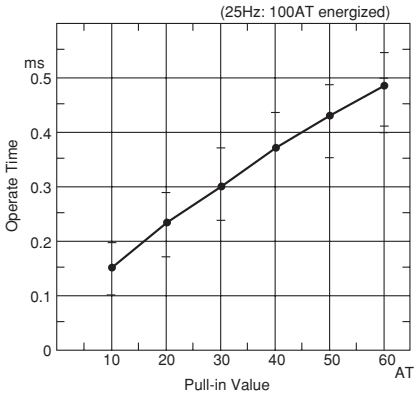
(5) Electrostatic Capacitance



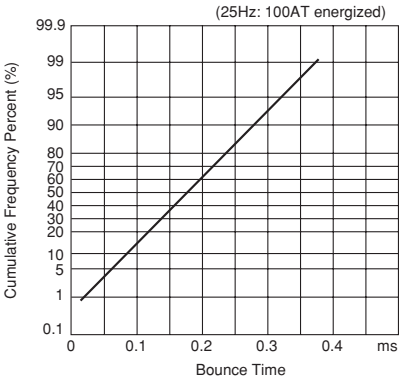
■ OPERATING CHARACTERISTICS

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

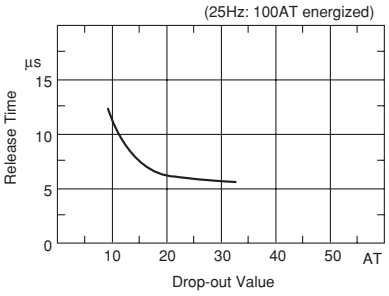
(1) Operate Time



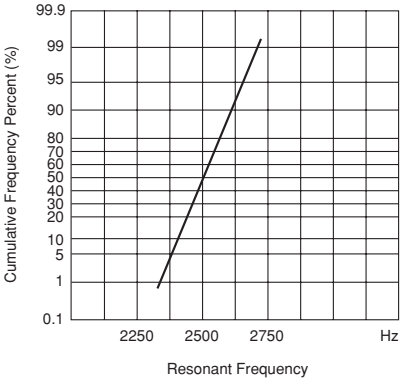
(2) Bounce Time



(3) Release Time

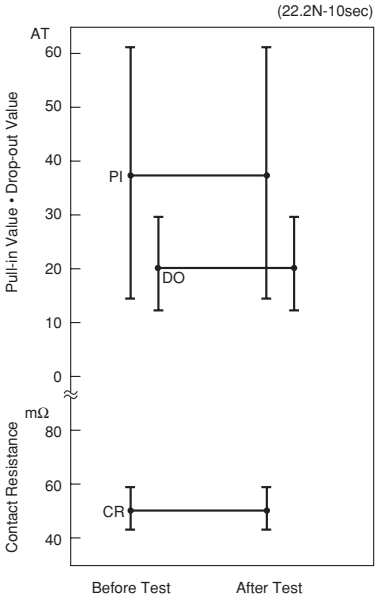


(4) Resonant Frequency

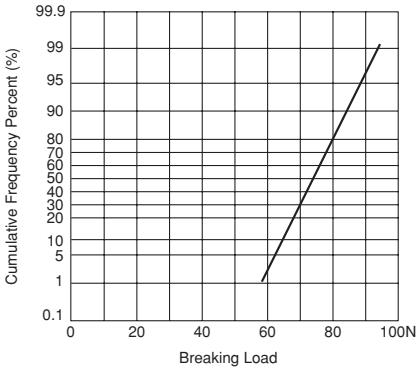


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (Static Load)



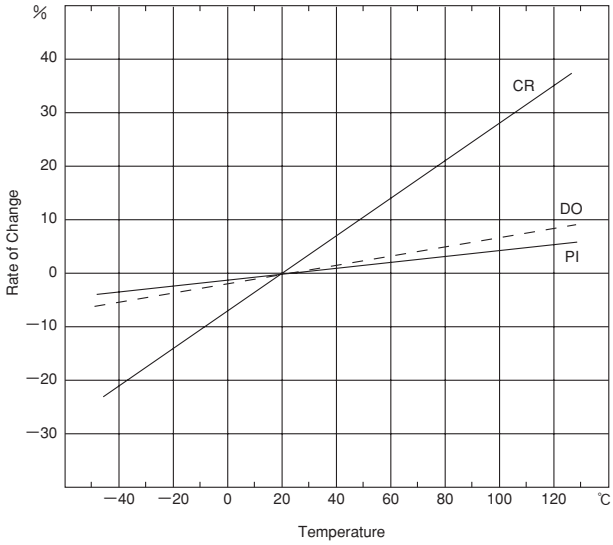
(2) Lead Tensile Strength



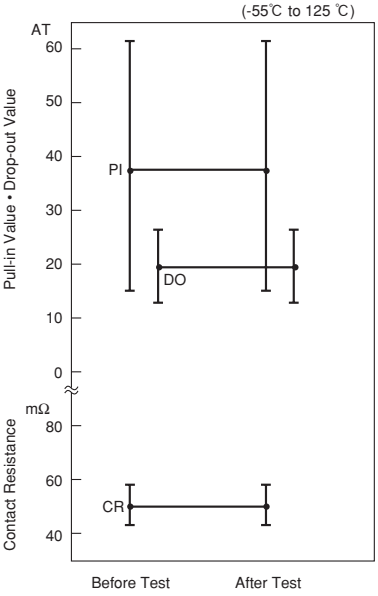
3

■ ENVIRONMENTAL CHARACTERISTICS

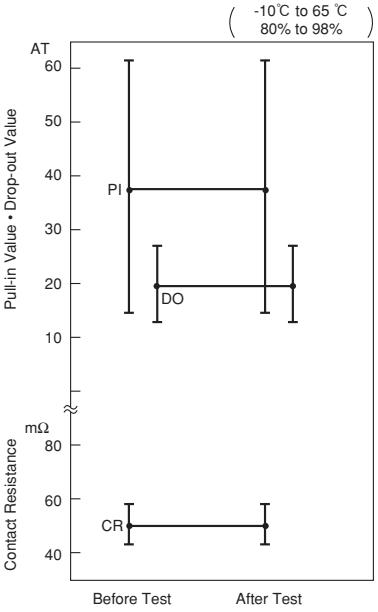
(1) Temperature Characteristics



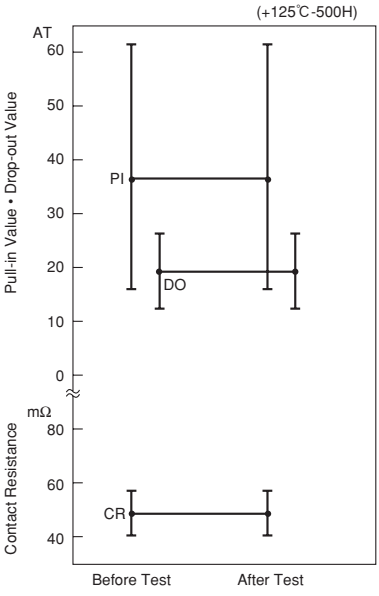
(2) Temperature Cycle



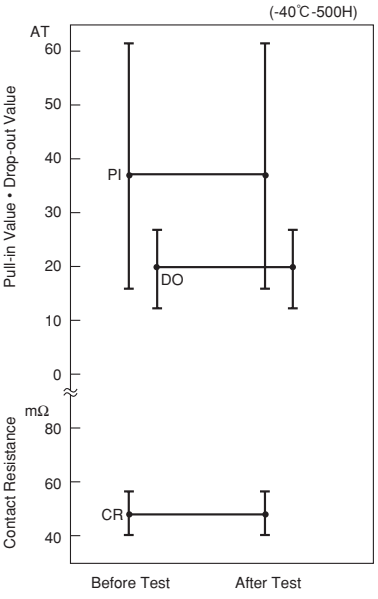
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

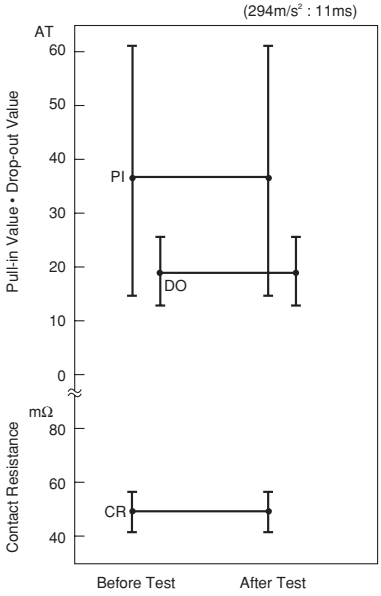


(5) Low Temperature Storage Test

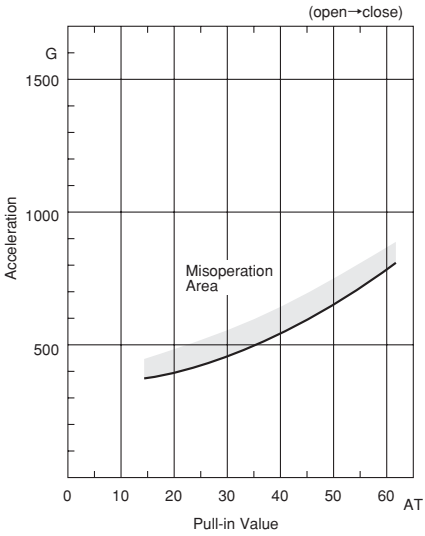


(6) Shock Test

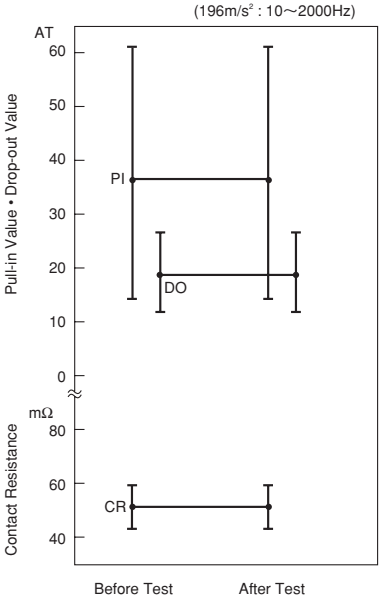
1) Electrical Characteristics



2) Misoperation Area



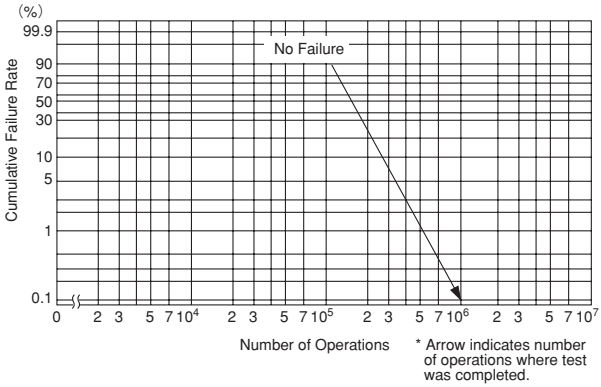
(7) Vibration Test



3

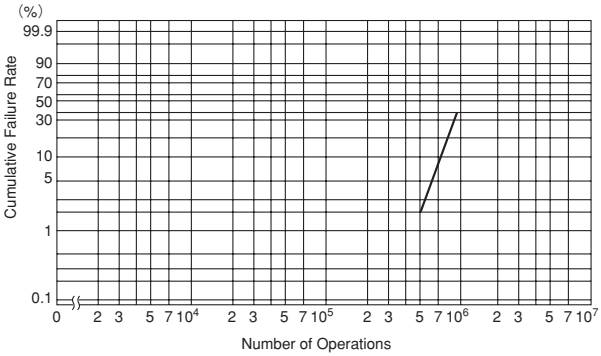
■ LIFE EXPECTANCY DATA: ORD2210V

Load Conditions
Voltage: 200VDC
Current: 1mA
Load: Resistive Load

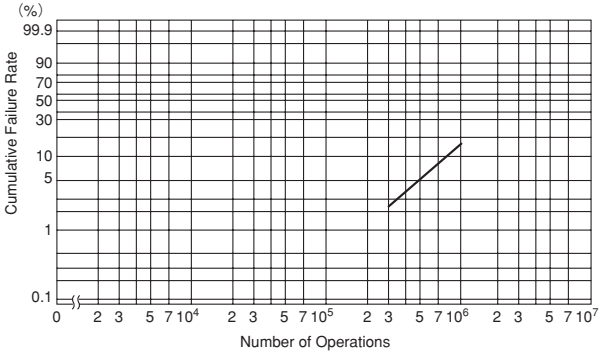


* Arrow indicates number of operations where test was completed.

Load Conditions
Voltage: 500VDC
Current: 1mA
Load: Resistive Load



Load Conditions
Voltage: 1kVDC
Current: 1mA
Load: Resistive Load



REED SWITCH

ORD2211

Lamp load

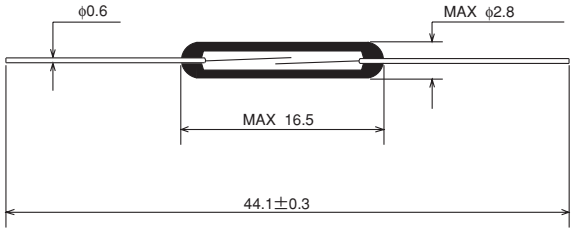
■ GENERAL DESCRIPTION

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

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

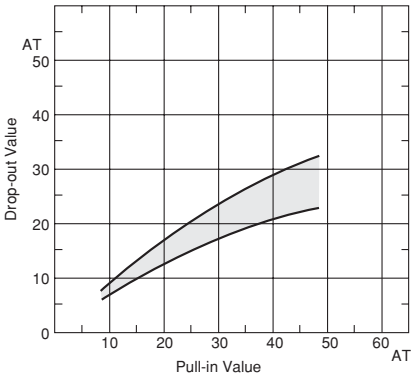
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

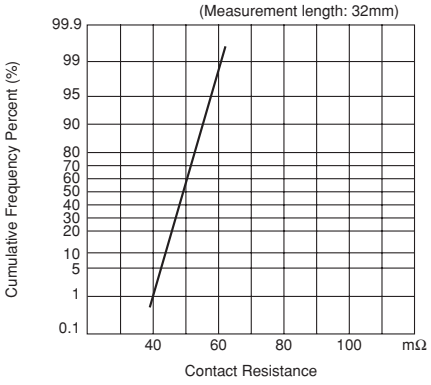
Parameter	Rated Value	Unit
Pull-in Value (PI)	20～40	AT
Drop-out Value (DO)	8min	AT
Contact Resistance (CR)	100max	mΩ
Breakdown Voltage	200min	VDC
Insulation Resistance	10^9min	Ω
Electrostatic Capacitance	0.3max	pF
Contact Rating	50 (12V-3.4W lamp)	VA
Maximum Switching Voltage	100 (DC/AC)	V
Maximum Switching Current	0.5 (Inrush 3A)	A
Maximum Carry Current	2.5	A

3

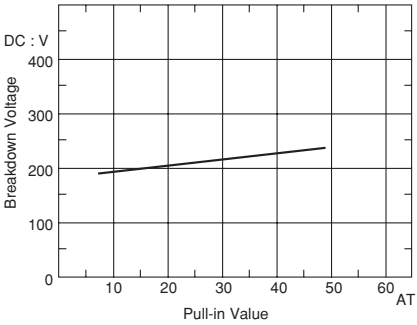
(1) Pull-in Value vs. Drop-out Value



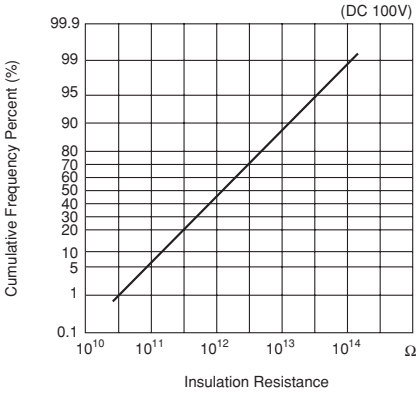
(2) Contact Resistance



(3) Breakdown Voltage

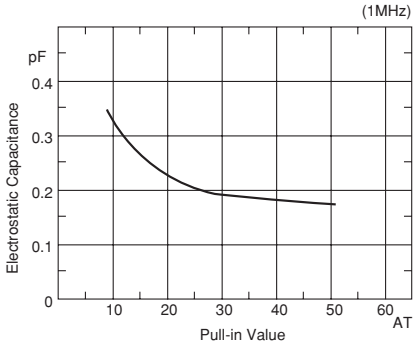


(4) Insulation Resistance



3

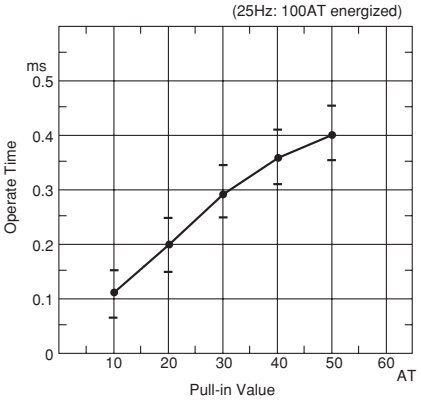
(5) Electrostatic Capacitance



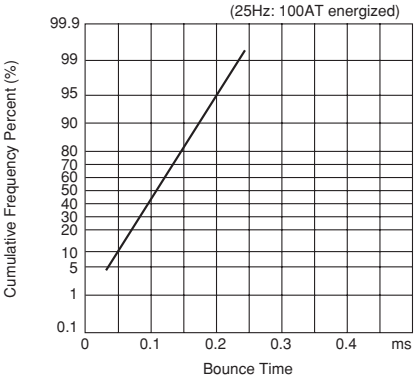
■ OPERATING CHARACTERISTICS

Parameter	Rated Value	Unit
Operate Time	0.6max	ms
Bounce Time	0.4max	ms
Release Time	0.05max	ms
Resonant Frequency	4600±400	Hz
Maximum Operating Frequency	500	Hz

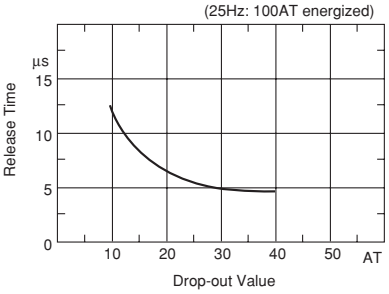
(1) Operate Time



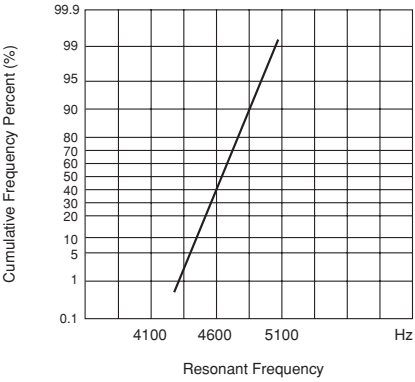
(2) Bounce Time



(3) Release Time

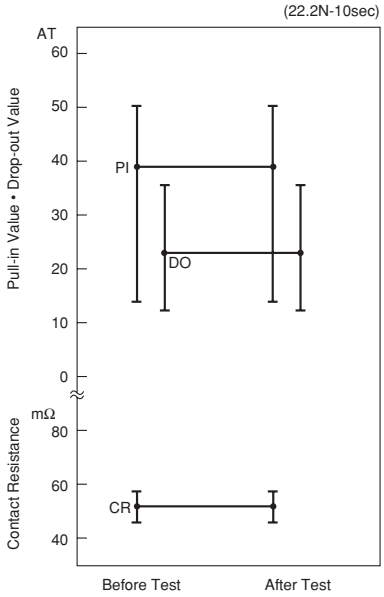


(4) Resonant Frequency

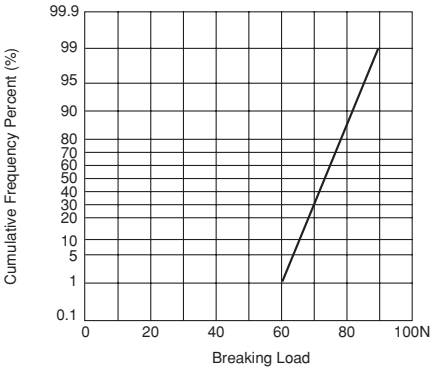


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (static Load)

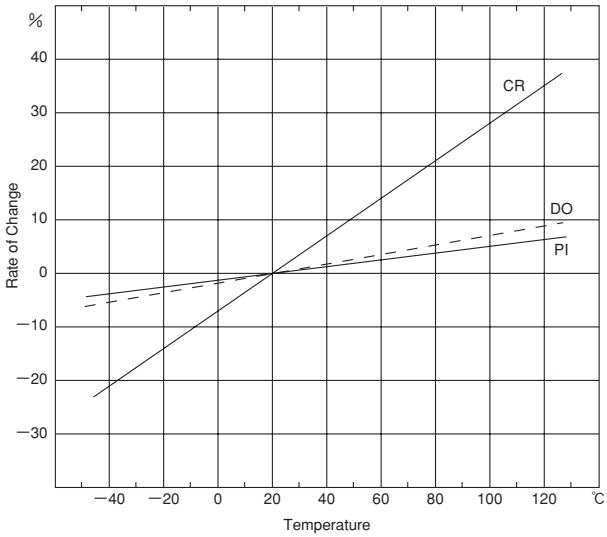


(2) Lead Tensile Strength



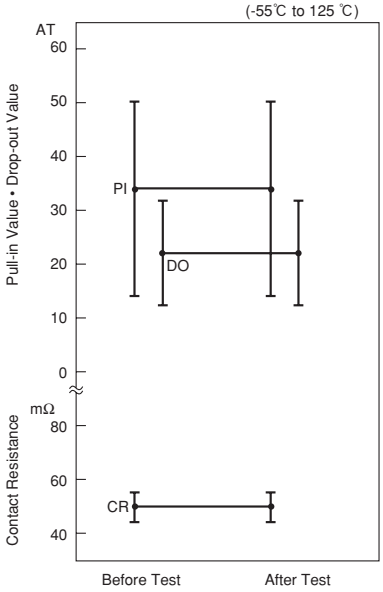
■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature Characteristics

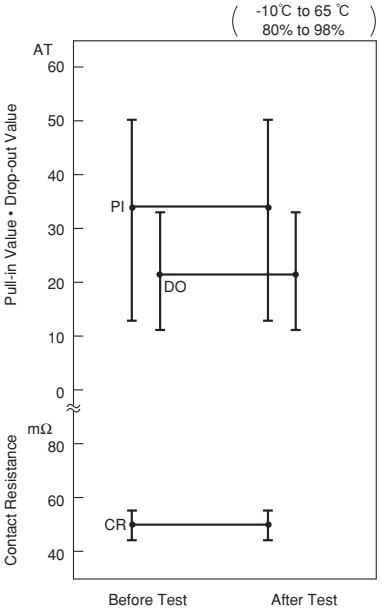


3

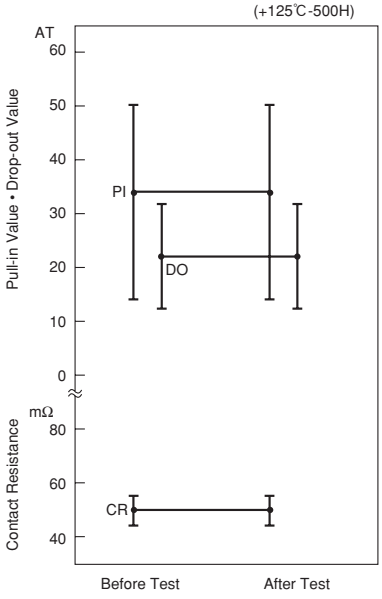
(2) Temperature Cycle



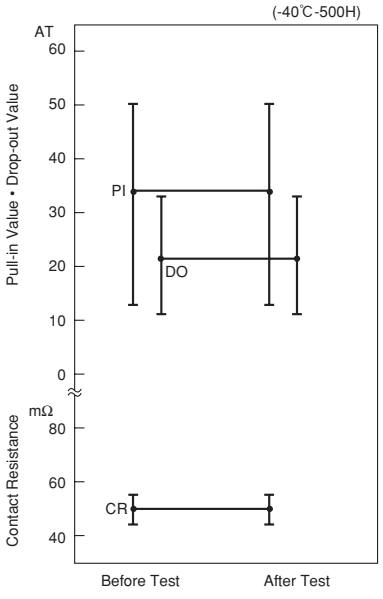
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

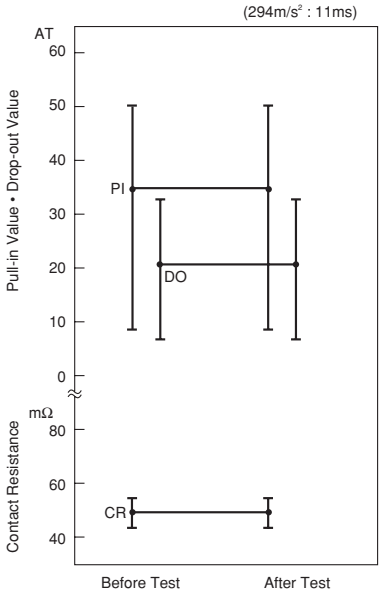


(5) Low Temperature Storage Test

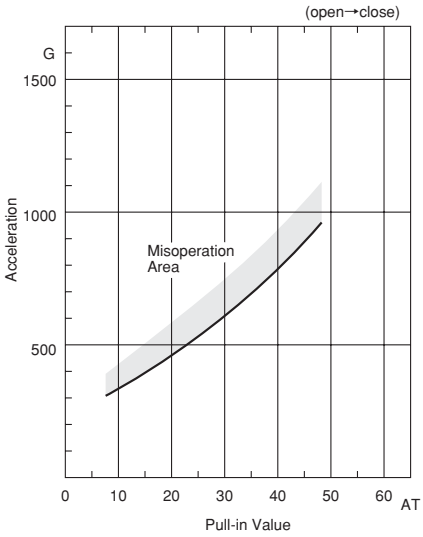


(6) Shock Test

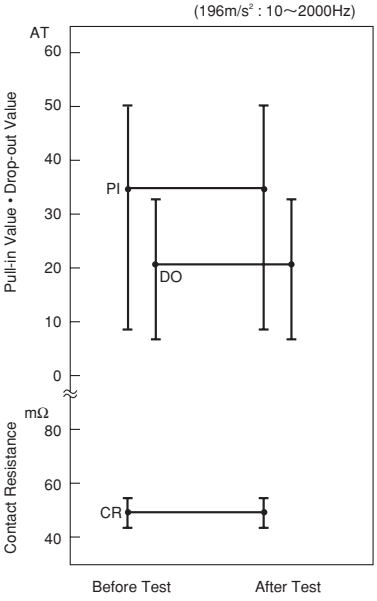
1) Electrical Characteristics



2) Misoperation Area



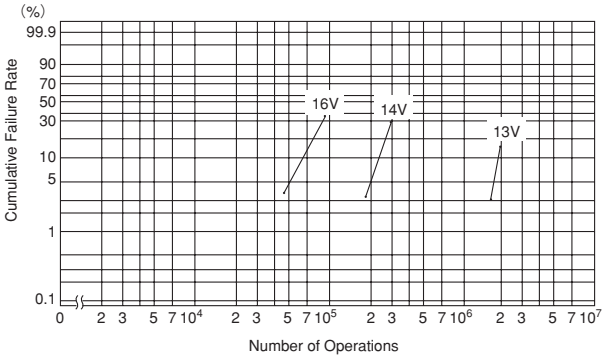
(7) Vibration Test



3

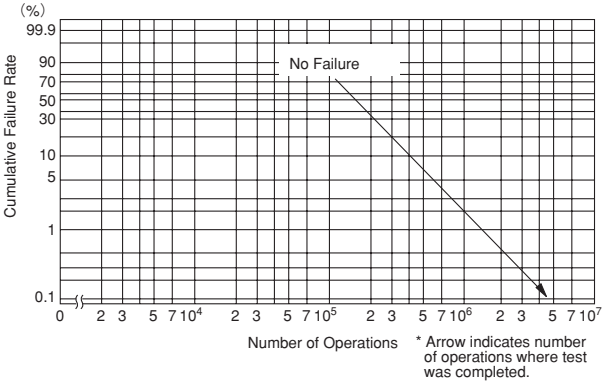
■ LIFE EXPECTANCY DATA: ORD2211

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

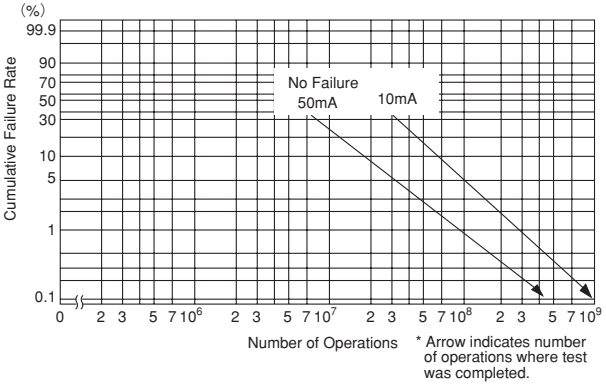


3

Load Conditions
Voltage: 50VDC
Current: 1A
Load: Resistive Load



Load Conditions
Voltage: 6VDC
Current: 10mA, 50mA
Load: Resistive Load



REED SWITCH

ORD2211H

Lamp load, long lead-type

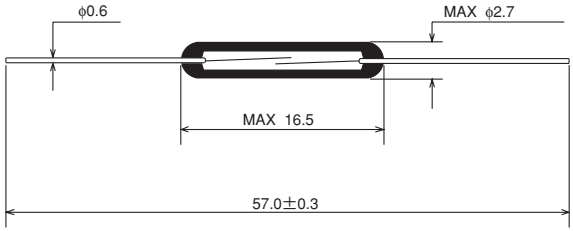
■ GENERAL DESCRIPTION

The ORD2211H is a long lead, single contact reed switch designed for direct opening or closing lamps of 12V - 3.4W. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



■ APPLICATIONS

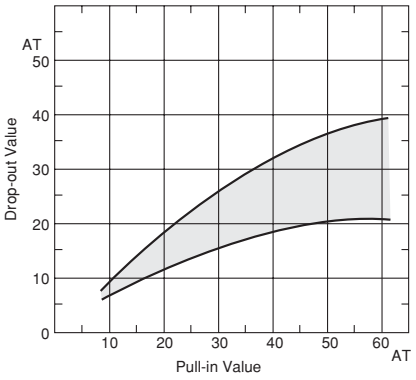
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances

■ ELECTRICAL CHARACTERISTICS

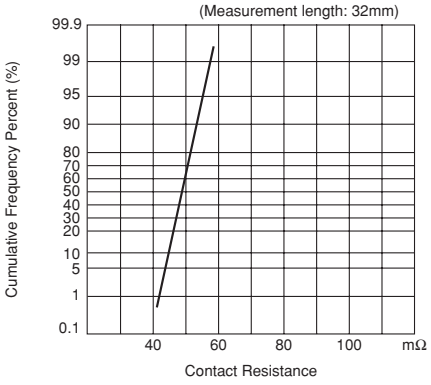
Parameter	Rated Value	Unit
Pull-in Value (PI)	20～40	AT
Drop-out Value (DO)	8min	AT
Contact Resistance (CR)	100max	mΩ
Breakdown Voltage	200min	VDC
Insulation Resistance	10^9min	Ω
Electrostatic Capacitance	0.3max	pF
Contact Rating	50 (12V-3.4W lamp)	VA
Maximum Switching Voltage	100 $\left(\begin{smallmatrix}DC\\AC\end{smallmatrix}\right)$	V
Maximum Switching Current	0.5 (Inrush 3A)	A
Maximum Carry Current	2.5	A

3

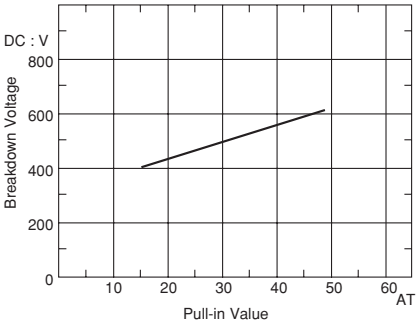
(1) Pull-in Value vs. Drop-out Value



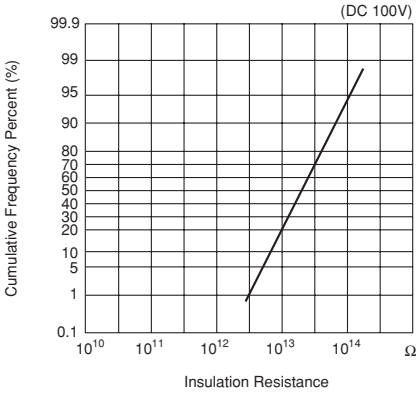
(2) Contact Resistance



(3) Breakdown Voltage

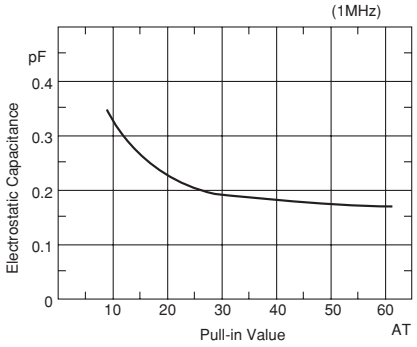


(4) Insulation Resistance



3

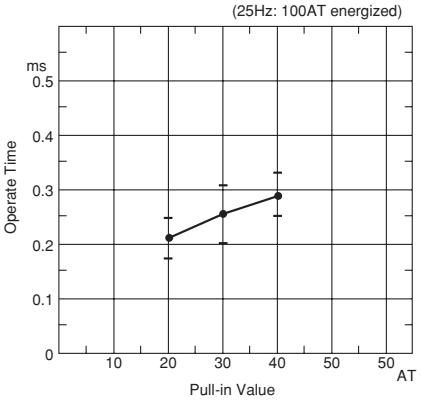
(5) Electrostatic Capacitance



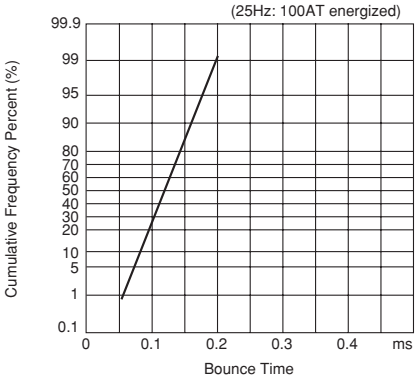
■ OPERATING CHARACTERISTICS

Parameter	Rated Value	Unit
Operate Time	0.6max	ms
Bounce Time	0.4max	ms
Release Time	0.05max	ms
Resonant Frequency	4600±400	Hz
Maximum Operating Frequency	500	Hz

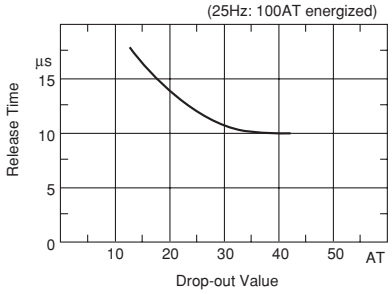
(1) Operate Time



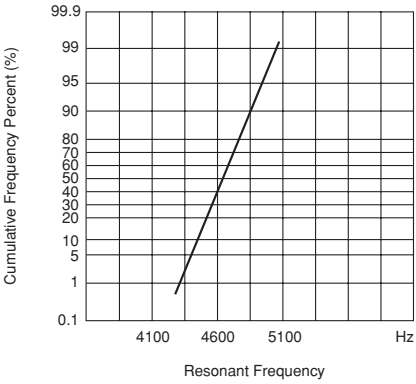
(2) Bounce Time



(3) Release Time

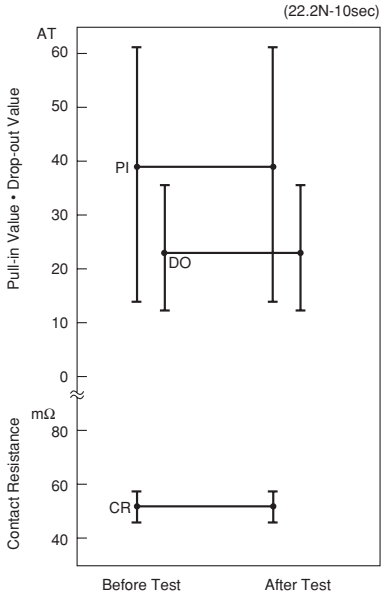


(4) Resonant Frequency

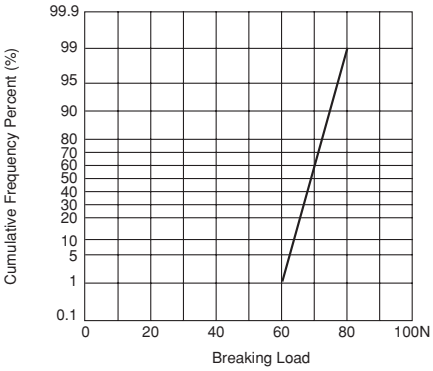


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (Static Load)

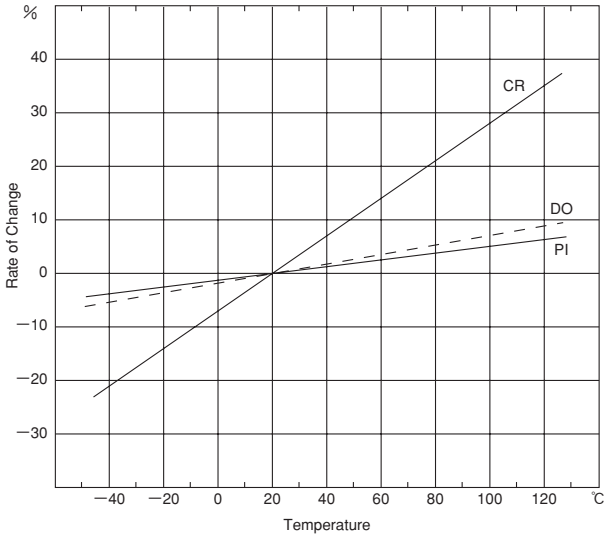


(2) Lead Tensile Strength



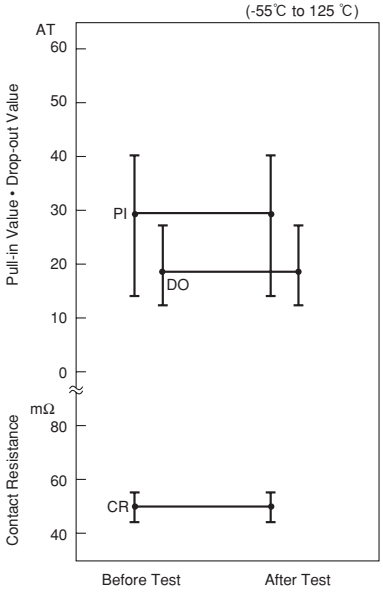
■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature Characteristics

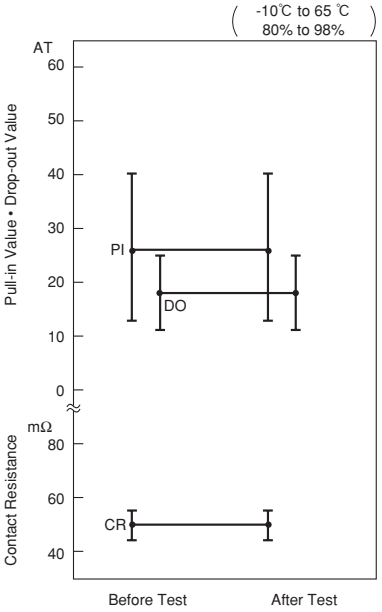


3

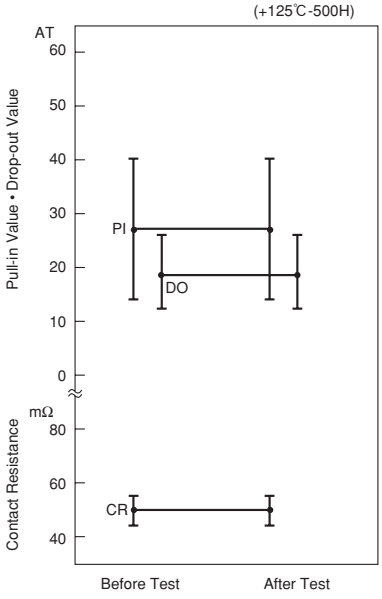
(2) Temperature Cycle



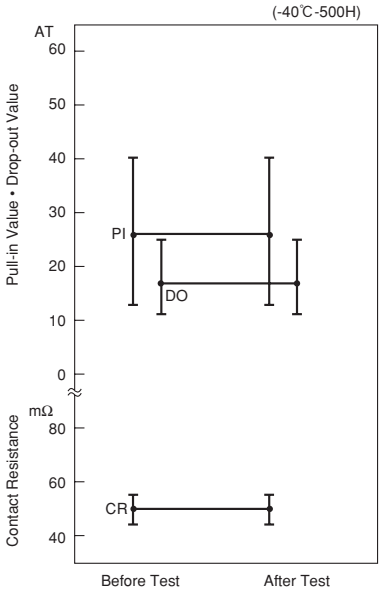
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

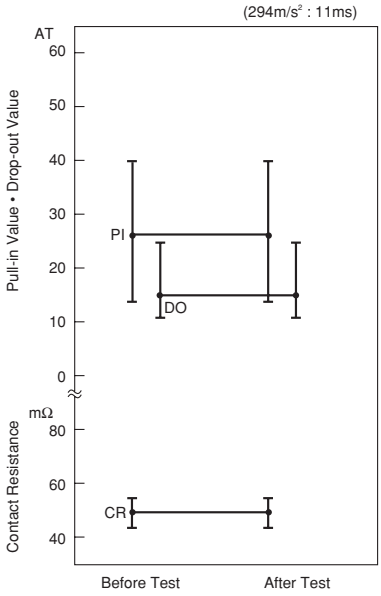


(5) Low Temperature Storage Test

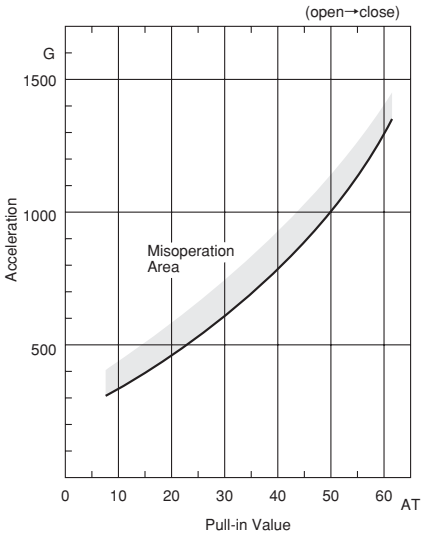


(6) Shock Test

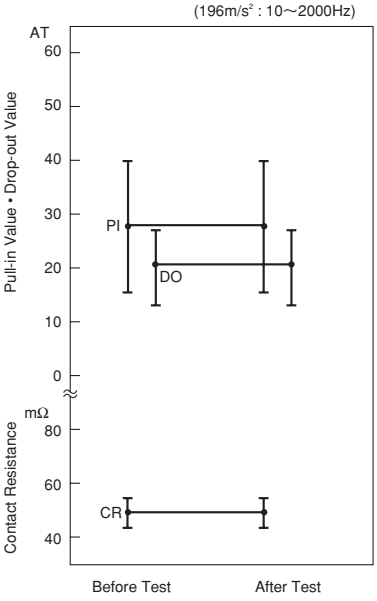
1) Electrical Characteristics



2) Misoperation Area



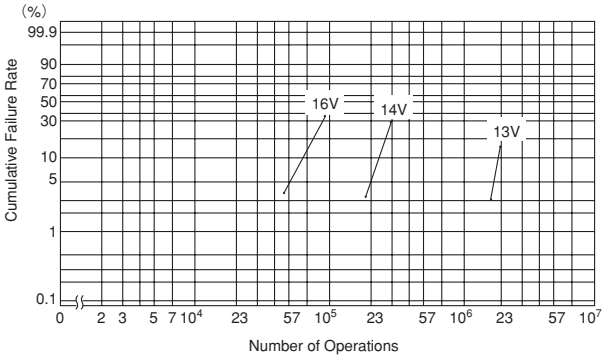
(7) Vibration Test



3

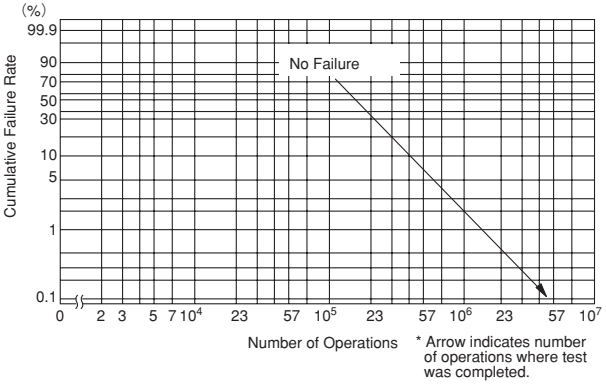
■ LIFE EXPECTANCY DATA: ORD2211H

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

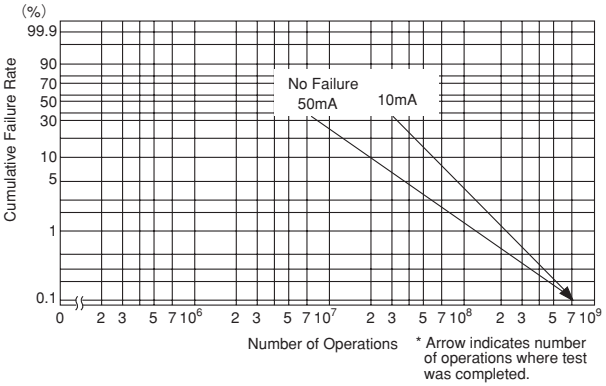


3

Load Conditions
Voltage: 50VDC
Current: 1A
Load: Resistive Load



Load Conditions
Voltage: 6VDC
Current: 10mA, 50mA
Load: Resistive Load



REED SWITCH

ORT551

Ultra-miniature transfer

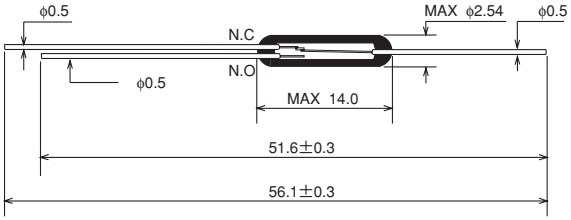
■ GENERAL DESCRIPTION

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

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)



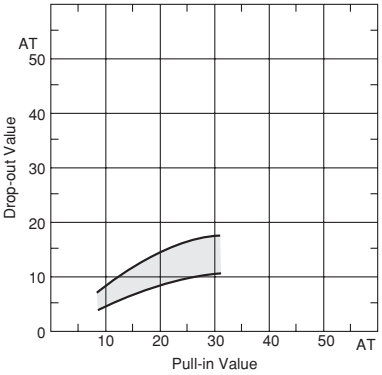
■ APPLICATIONS

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

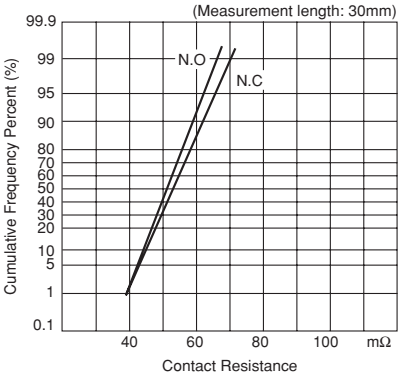
■ ELECTRICAL CHARACTERISTICS

Parameter	Rated Value	Unit
Pull-in Value (PI)	10～30	AT
Drop-out Value (DO)	4min	AT
Contact Resistance (CR)	100max	mΩ
Breakdown Voltage	200min (PI≧20)	VDC
	150min (10≦PI＜20)	VDC
Insulation Resistance	10^9min	Ω
Electrostatic Capacitance	1.5max	pF
Contact Rating	3	VA
Maximum Switching Voltage	30 $\binom{DC}{AC}$	V
Maximum Switching Current	0.2	A
Maximum Carry Current	0.5	A

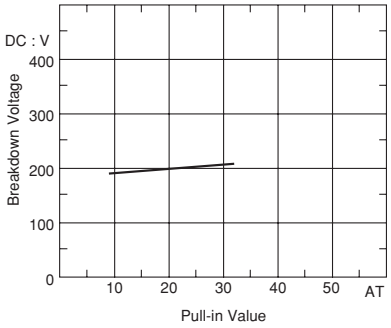
(1) Pull-in Value vs. Drop-out Value



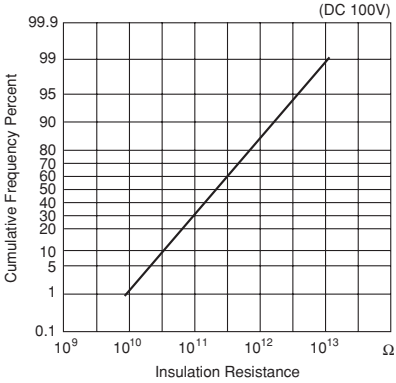
(2) Contact Resistance



(3) Breakdown Voltage

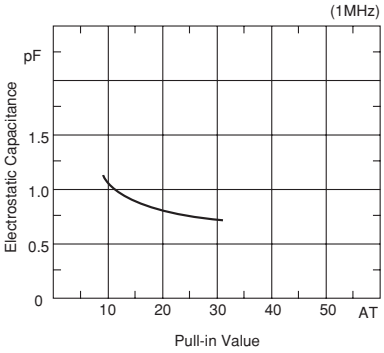


(4) Insulation Resistance



3

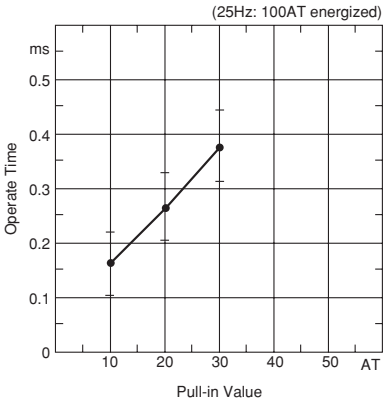
(5) Electrostatic Capacitance



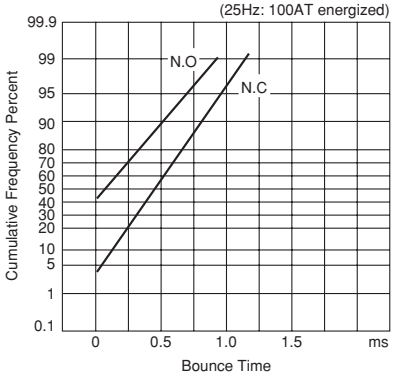
■ OPERATING CHARACTERISTICS

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

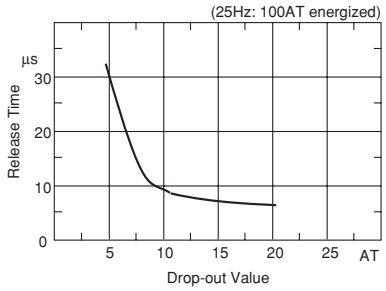
(1) Operate Time



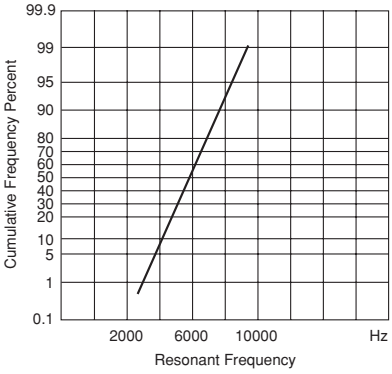
(2) Bounce Time



(3) Release Time

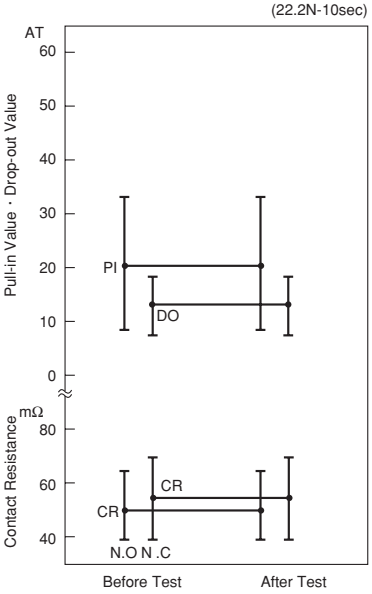


(4) Resonant Frequency

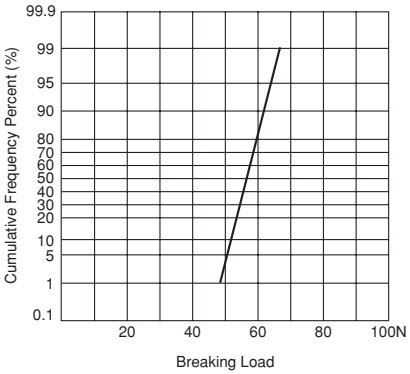


■ MECHANICAL CHARACTERISTICS

(1) Lead Tensile Test (Static Load)

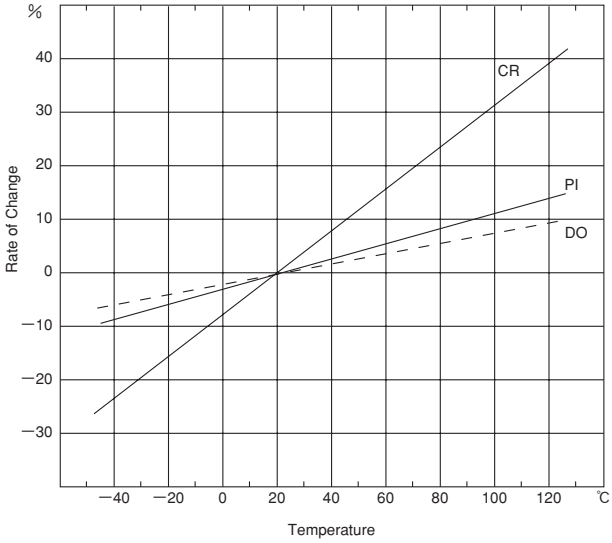


(2) Lead Tensile Strength



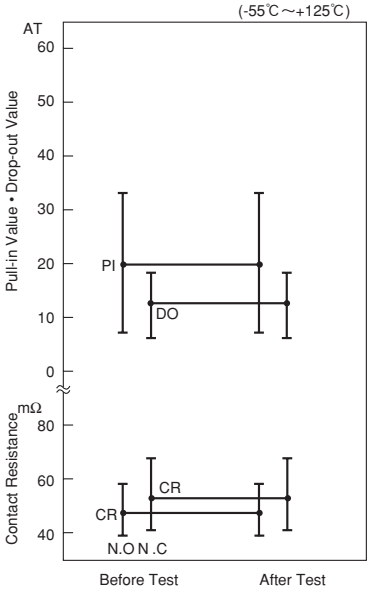
■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature Characteristics

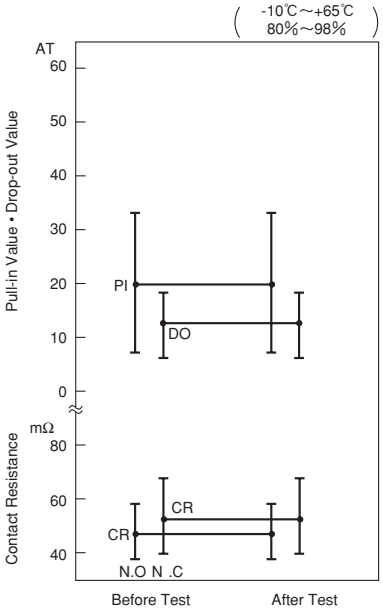


3

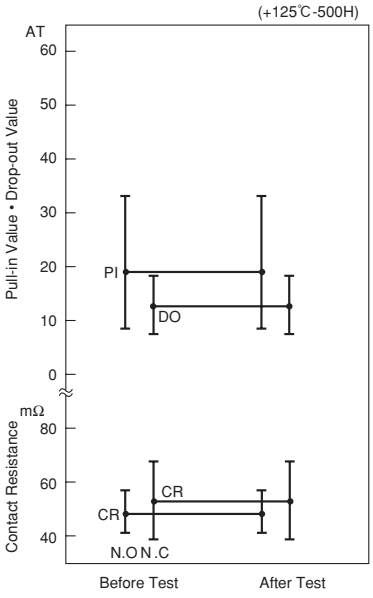
(2) Temperature Cycle



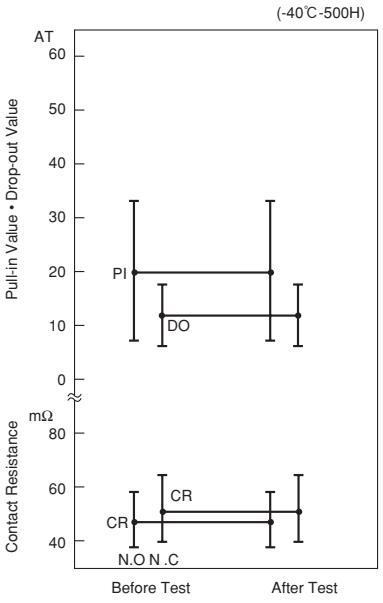
(3) Temperature and Humidity Cycle



(4) High Temperature Storage Test

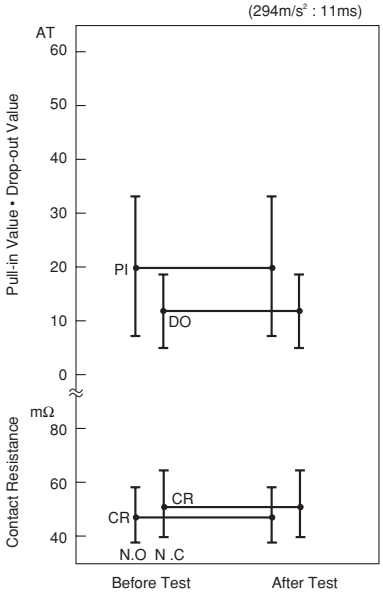


(5) Low Temperature Storage Test

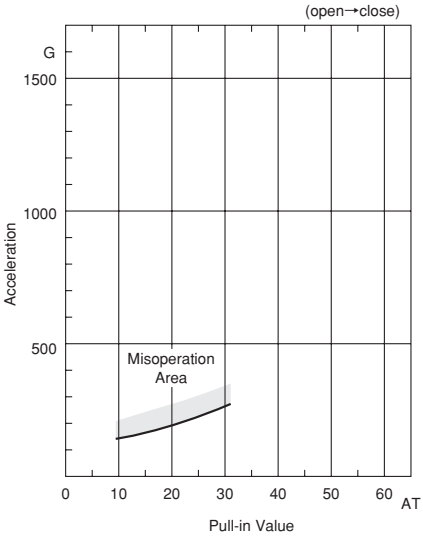


(6) Shock Test

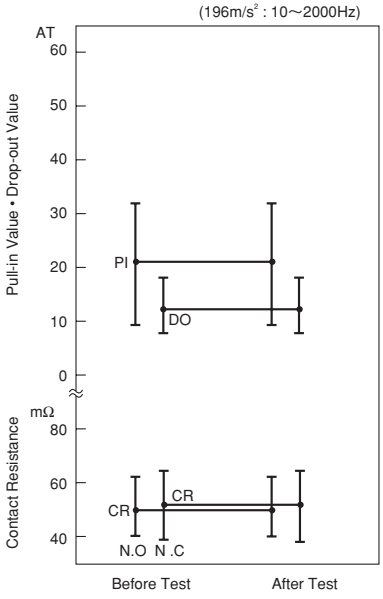
1) Electrical Characteristics



2) Misoperation Area



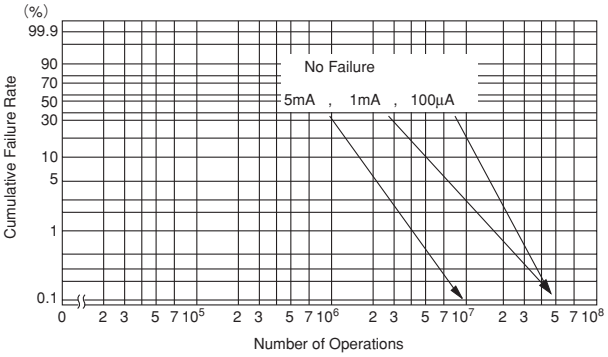
(7) Vibration Test



3

■ LIFE EXPECTANCY DATA: ORT551

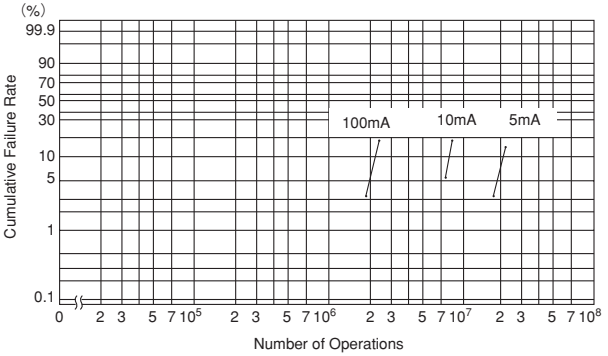
Load Conditions
Voltage: 5VDC
Current: 100μA, 1mA, 5mA
Load: Resistive Load



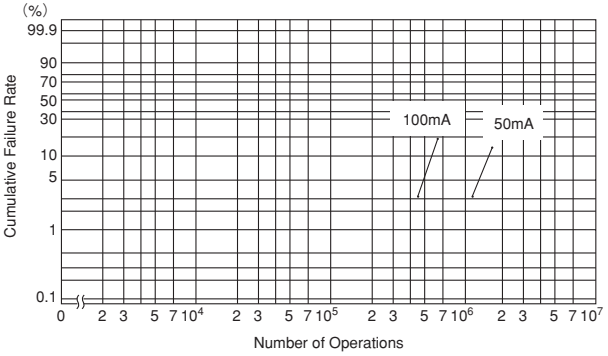
* Arrow indicates number of operations where test was completed.

3

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



Load Conditions
Voltage: 24VDC
Current: 50mA, 100mA
Load: Resistive Load



MOLDED SWITCH

RA-901

Miniature SMD

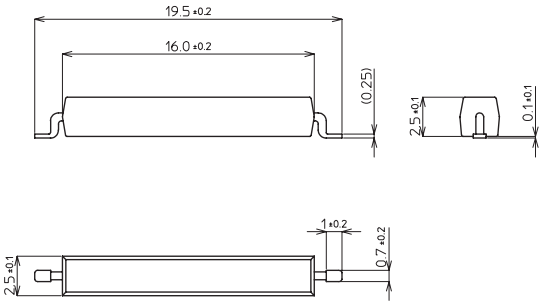
■ GENERAL DESCRIPTION

The RA-901 is a molded ORD228VL reed switch with processed leads. While boasting the excellent characteristics of the ORD228VL, the molded exterior ensures ease of handling.

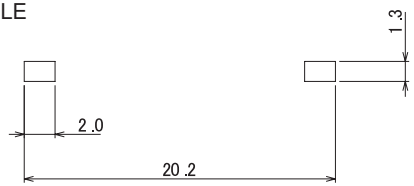
■ FEATURES

(1) Gull wing shape leads for SMT applications
(2) Automatic mounting of component by tape and reel
(3) Enhanced shock resistance due to resin mold protecting 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

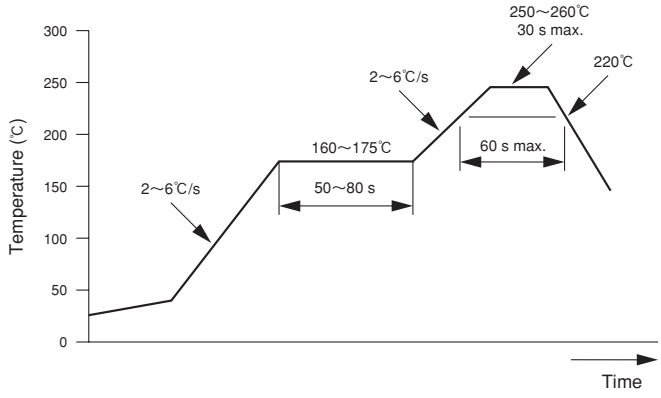
Contact Form	1A
Pull-in Value (PI)	15～49AT
Drop-out Value (DO)	10AT (Min.)
Contact Resistance (CR)	100mΩ (Max.)
Contact Rating	10VA
Maximum Switching Voltage	100V DC/AC
Maximum Switching Current	0.5A
Maximum Carry Current	1.0A
Breakdown Voltage	200V (Min.)
Insulation Resistance	$1\times10^{9}\Omega$ (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℃
Storage Temperature Range	—50～125℃
Electrostatic Capacitance	0.3pF (Max.)
Resonant Frequency	5400Hz (typ)
Maximum Operating Frequency	500Hz

3

■ PULL-IN VALUE TABLE (After forming)

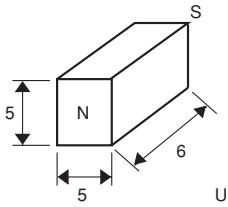
Model No.	1	2	3	4	5	6	7	8
Pull-in Value (AT)	15～34	18～36	19～39	21～42	24～45	27～49	30～49	34～49

■ Reflow Conditions



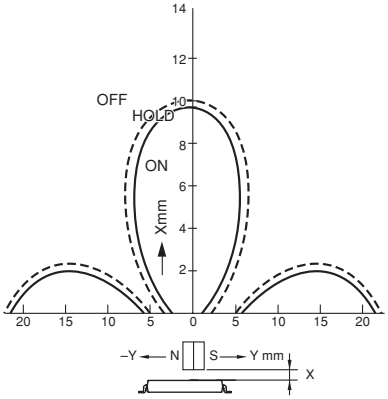
■ Magnet Drive Characteristics Example (1)

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)

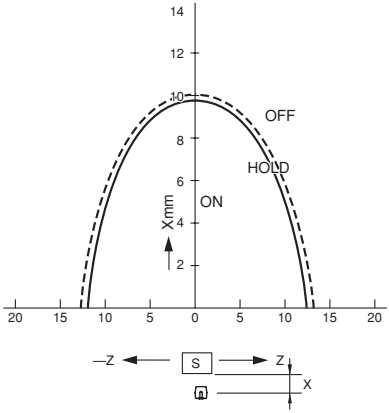


Unit: mm

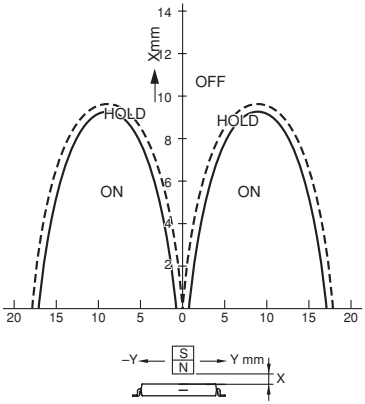
(1) X-Y Characteristic H



(2) X-Z Characteristic H

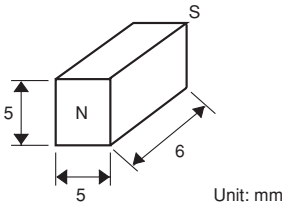


(3) X-Y Characteristic V

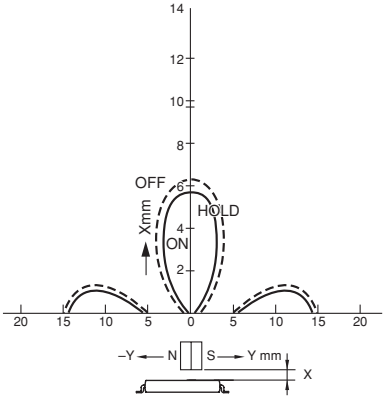


■ RA-901 Magnet Drive Characteristics Example (2)

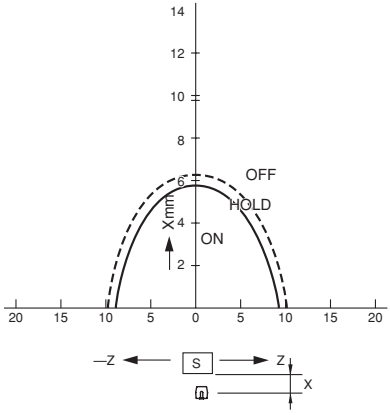
Magnet: 5 x 5 x 6 mm
Anisotropic barium ferrite
Surface magnetic flux 120 mT
Molded Switch: RA-901-1
Pull-in value 34.0 (AT)
Drop-out value 29.1 (AT)



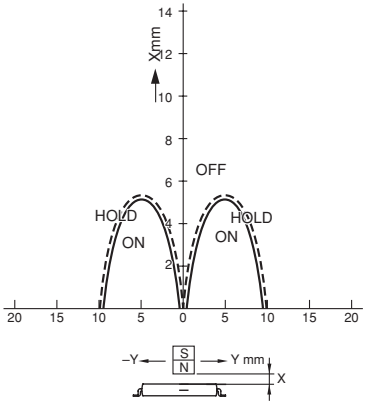
(1) X-Y Characteristic H



(2) X-Z Characteristic H

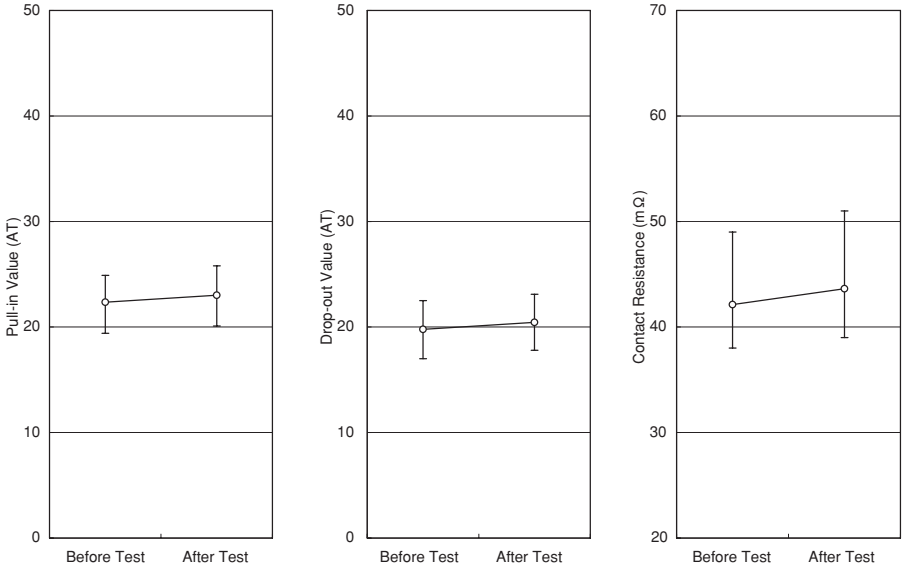


(3) X-Y Characteristic V

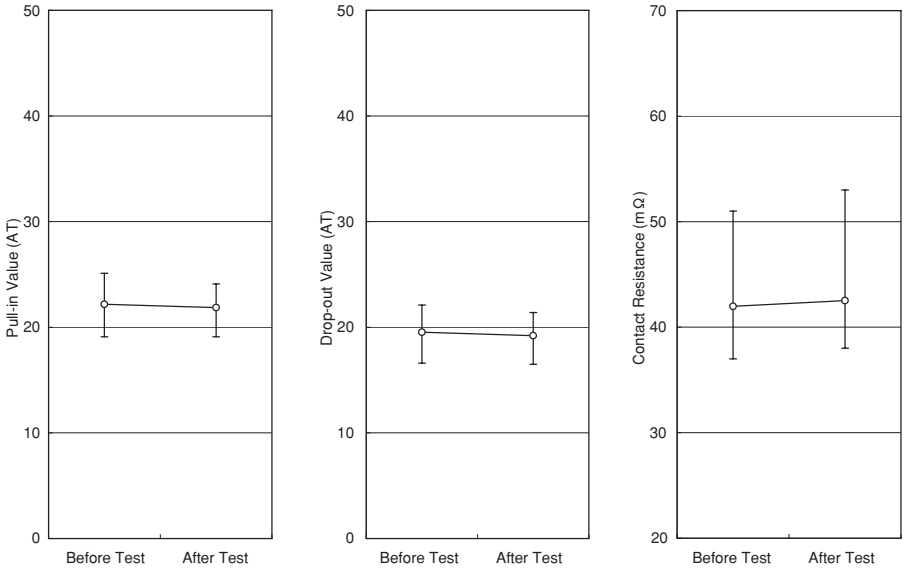


■ ENVIRONMENTAL CHARACTERISTICS

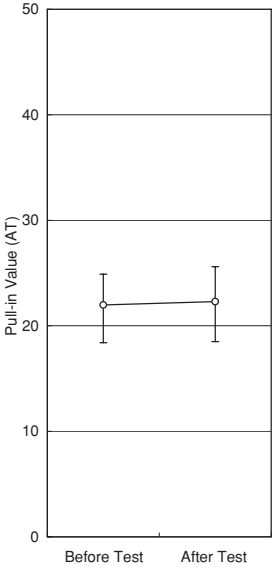
(1) Temperature Cycle (-55℃～+125℃)

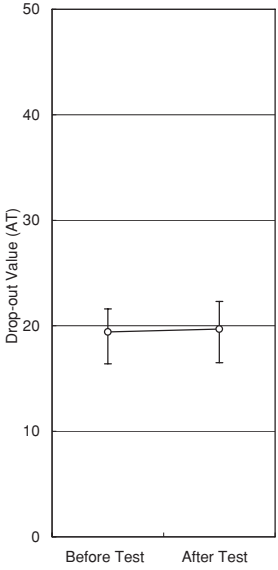


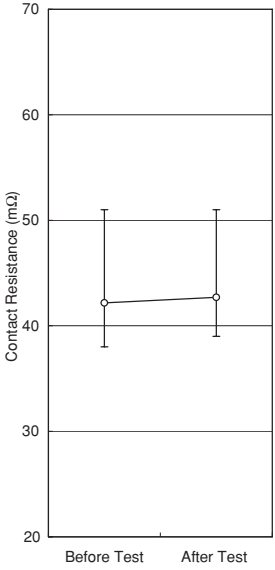
(2) Temperature and Humidity Cycle (-10℃～+65℃ 80%～98%)



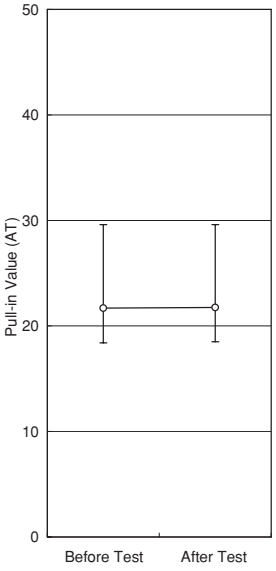
(3) High Temperature Storage Test (125℃ 500H)

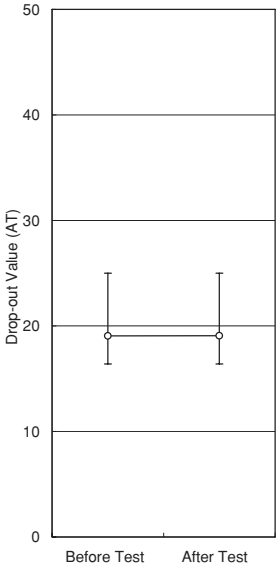


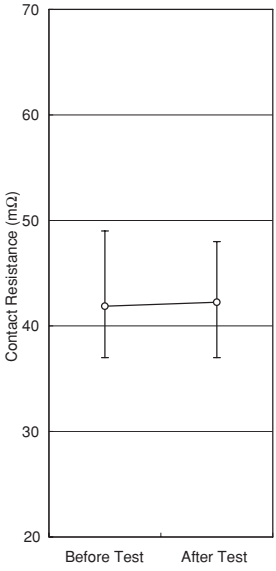




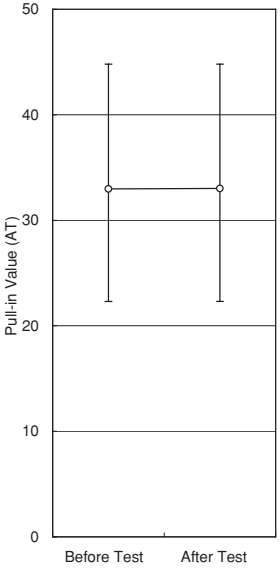
(4) Low Temperature Storage Test (-40℃ 500H)

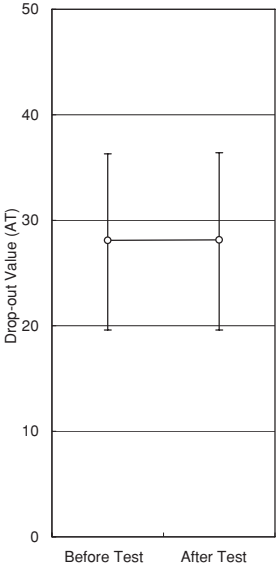


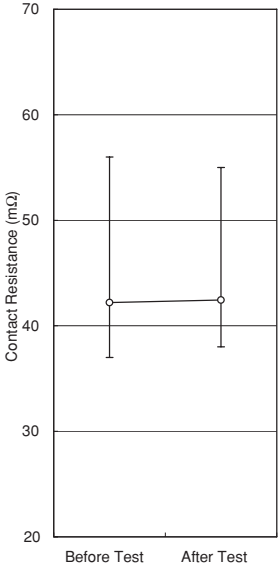




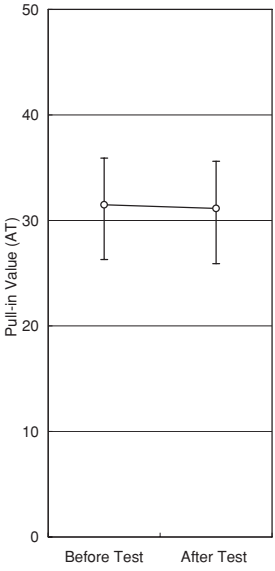
(5) Shock Test (490m/s^2 11msec)

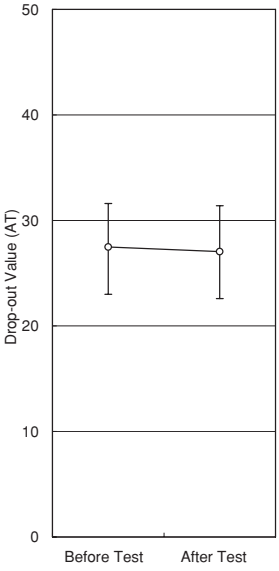


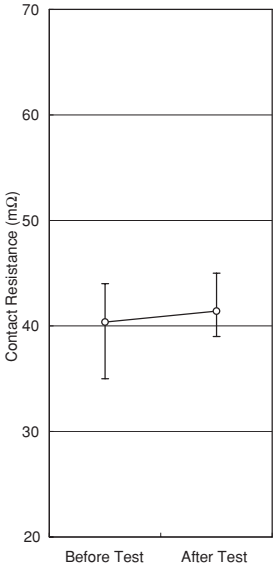




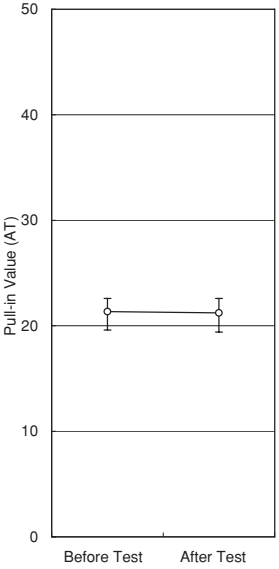
(6) Vibration Test (490m/s^2 10～2000Hz)

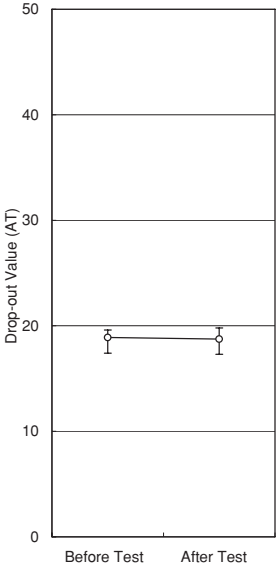


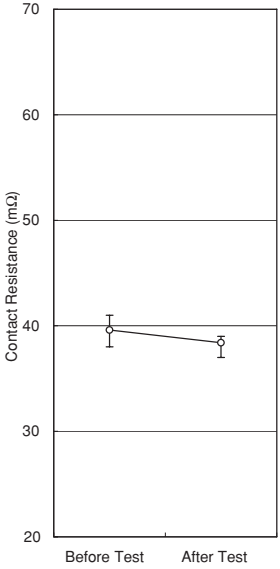




(7) Shock Resistance Test (ϕ 10mm steel ball free fall impact height 230 mm)







3

MOLDED SWITCH

RA-903

Ultra-miniature SMD

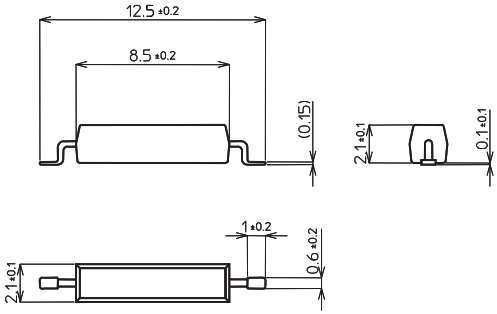
■ GENERAL DESCRIPTION

The RA-903 is a molded ORD213 reed switch with processed leads. While boasting the excellent characteristics of the ORD213, the molded exterior ensures ease of handling.

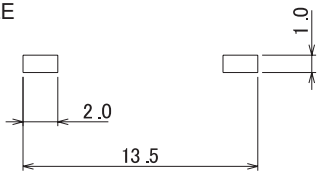
■ FEATURES

(1) Gull wing shape leads for SMT applications
(2) Automatic mounting of this component by tape and reel
(3) Enhanced shock resistance due to resin mold protecting the glass tube
(4) Ultra-compact and light weight

■ EXTERNAL DIMENSIONS (Unit: mm)



■ PAD LAYOUT SAMPLE



■ APPLICATIONS

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

■ SPECIFICATION

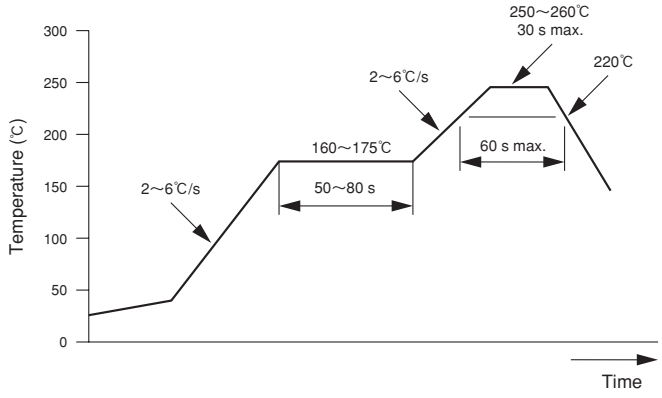
Contact Form	1A
Pull-in Value (PI)	16～46AT
Drop-out Value (DO)	10AT (Min.)
Contact Resistance (CR)	200mΩ (Max.)
Contact Rating	1VA
Maximum Switching Voltage	24V DC/AC
Maximum Switching Current	0.1A
Maximum Carry Current	0.3A
Breakdown Voltage	150V (Min.)
Insulation Resistance	$1\times10^{9}\Omega$ (Min.)
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℃
Storage Temperature Range	—50～125℃
Electrostatic Capacitance	0.4pF (Max.)
Resonant Frequency	13000Hz (typ)
Maximum Operating Frequency	500Hz

3

■ PULL-IN VALUE TABLE (After forming)

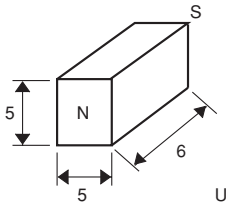
Model No.	1	2	3	4	5	6
Pull-in Value (AT)	16～29	18～32	20～34	22～36	24～42	28～46

■ Reflow Conditions



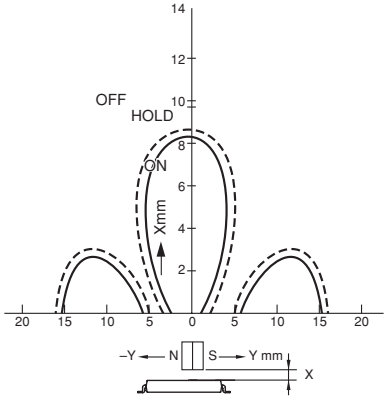
■ Magnet Drive Characteristics Example (1)

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)

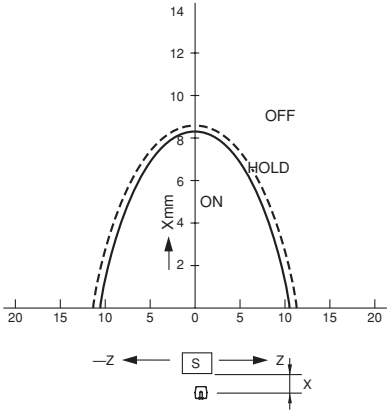


Unit: mm

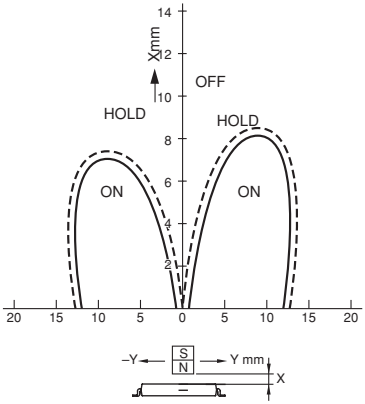
(1) X-Y Characteristic H



(2) X-Z Characteristic H

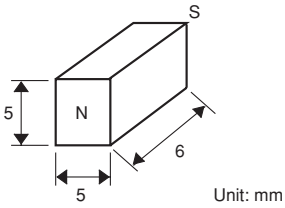


(3) X-Y Characteristic V



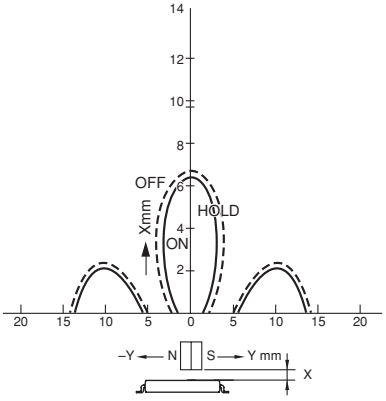
■ RA-903 Magnet Drive Characteristics Example (2)

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)

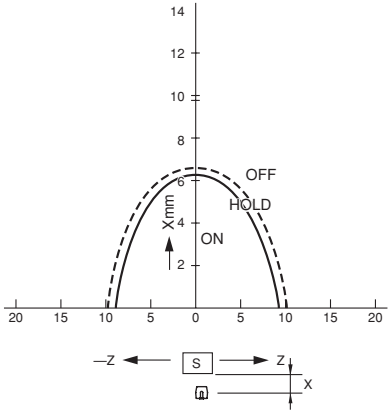


Unit: mm

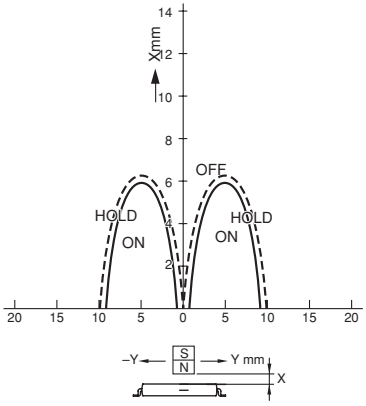
(1) X-Y Characteristic H



(2) X-Z Characteristic H

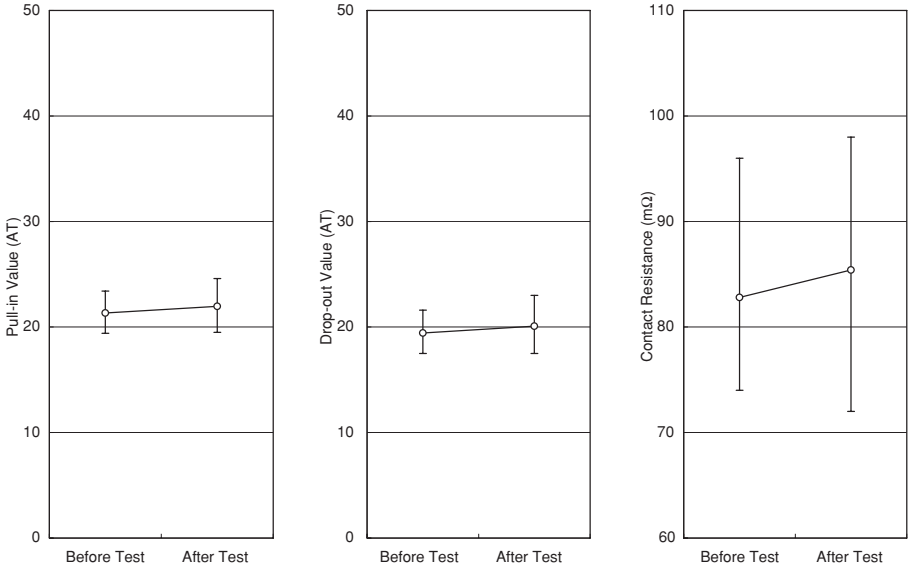


(3) X-Y Characteristic V

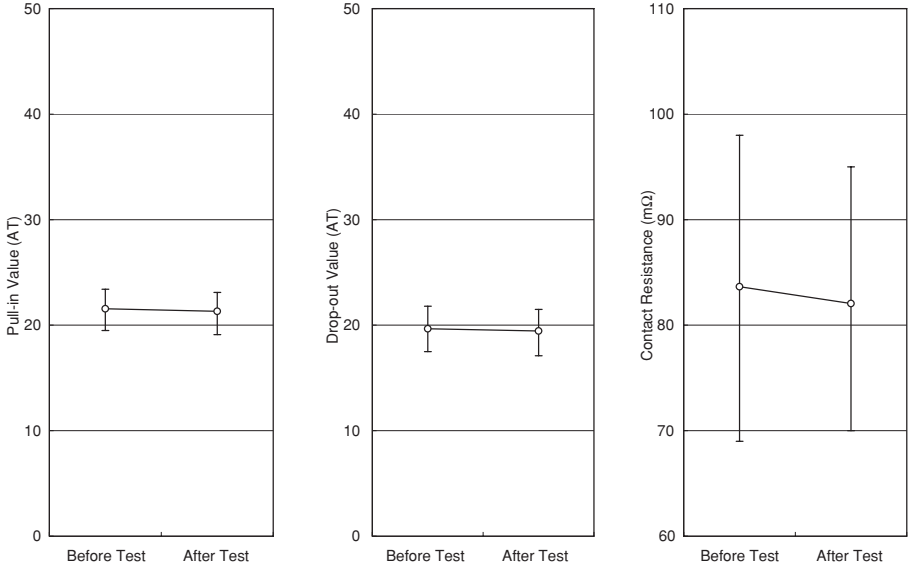


■ ENVIRONMENTAL CHARACTERISTICS

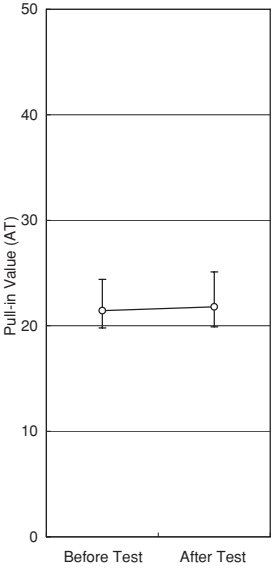
(1) Temperature Cycle (-55℃～+125℃)

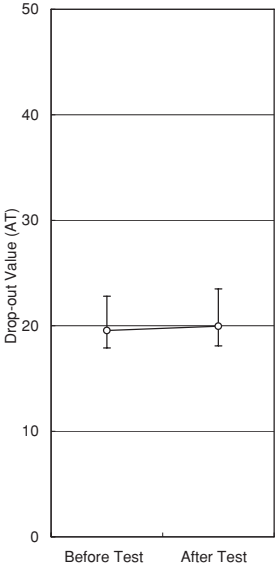


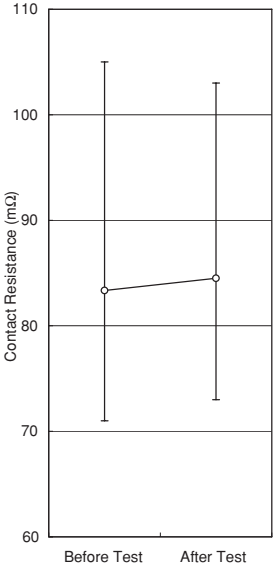
(2) Temperature and Humidity Cycle (-10℃～+65℃ 80%～98%)



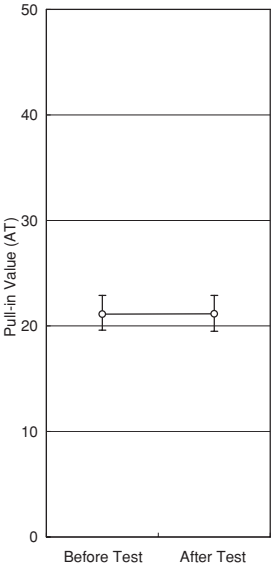
(3) High Temperature Storage Test (125℃ 500H)

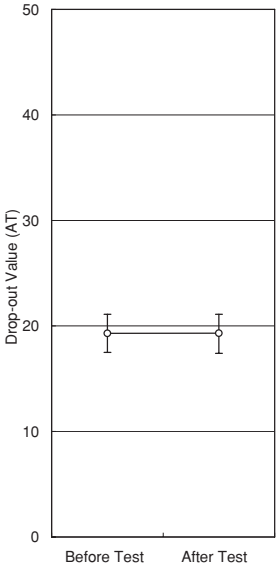


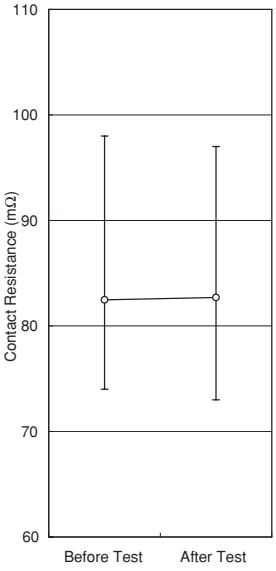




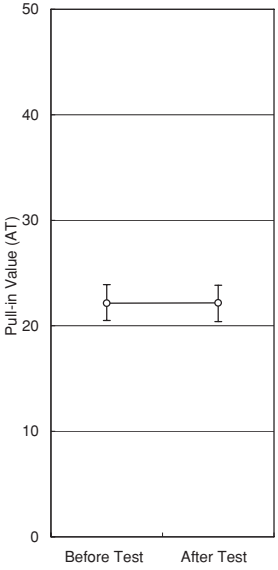
(4) Low Temperature Storage Test (-40℃ 500H)

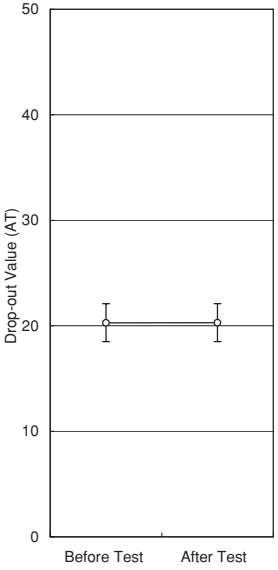


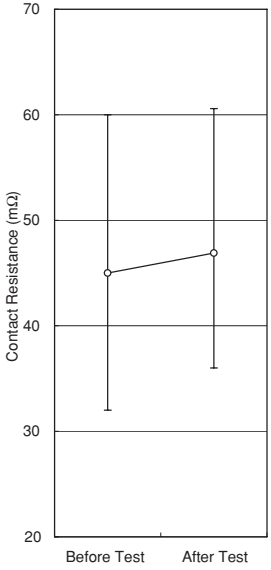




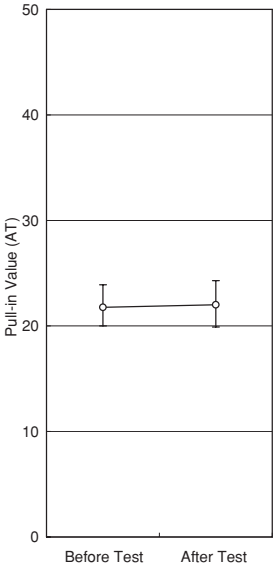
(5) Shock Test (490m/s^2 11msec)

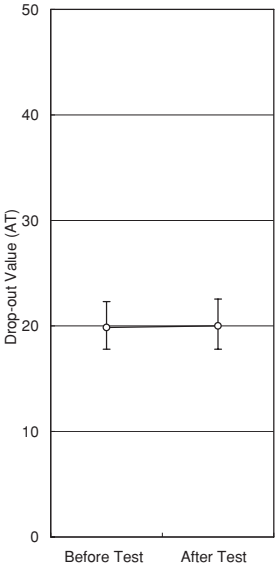


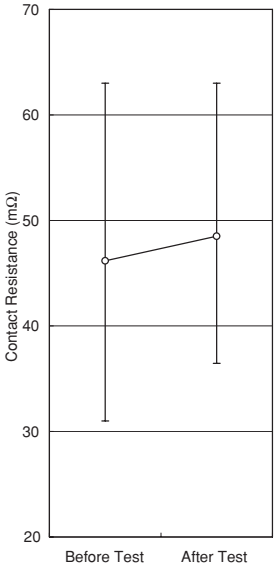




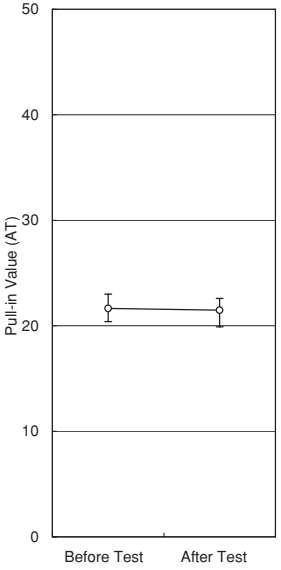
(6) Vibration Test (490m/s^2 10～2000Hz)

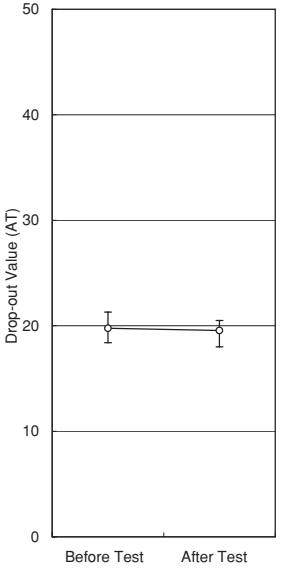


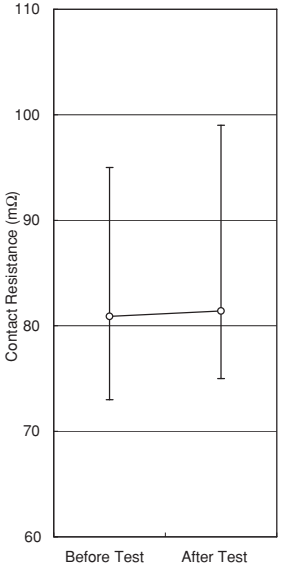




(7) Shock Resistance Test (ϕ 10mm steel ball, free fall impact height 230mm)







3