

**DESCRIPTION**

The new NEC EQ1 Series automotive relays are designed for motor and lamp control applications that require a high level of quality and performance. The EQ1 has a unique two-piece design for the magnetic circuit, which result in small size, light weight, and high productivity.

**FEATURES**

- PC board mounting
- Same pin-layout as MR301
- Approx. 70% less relay volume than MR301
- Approx. 80% less relay space than MR301
- Approx. 90% less relay height than MR301
- Approx. 60% less relay weight than MR301

**APPLICATIONS**

- Motor control
- Heater control
- Solenoid control
- Lamp control



EQ1 SERIES

**For Proper Use of Miniature Relays****DO NOT EXCEED MAXIMUM RATING**

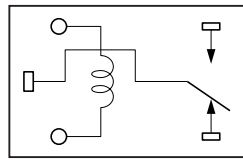
Do not use relay under excessive conditions such as over ambient temperature, over voltage and over current. Incorrect use could result in abnormal heating and damage to the relay or other parts.

**READ CAUTIONS IN THE SELECTION GUIDE.**

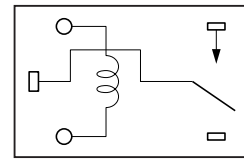
Read the cautions described in NEC's "Miniature Relays" (ER0046EJ\*) before dose designing your relay application.

The information in this document is subject to change without notice.

SCHEMATIC (BOTTOM VIEW)

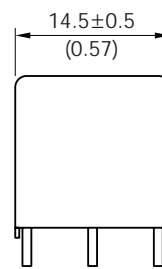
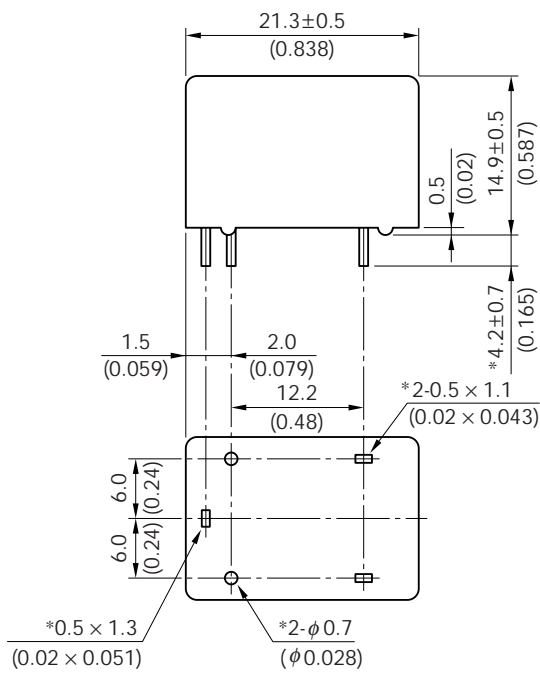


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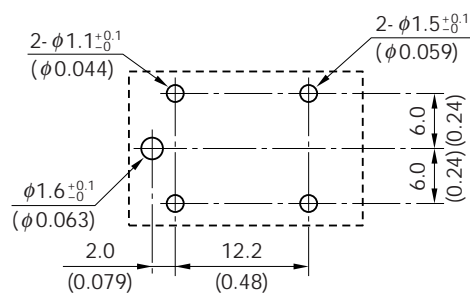
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DIMENSIONS mm (inch)



\* After Soldering

PCB PAD LAYOUT mm (inch) (BOTTOM VIEW)



SPECIFICATION

(at 20°C)

Items		For motor control		For lamp and LCR circuit control	
		EQ1-31000S	EQ1-11040S	EQ1-11111S	EQ1-22111S
Contact Form		1 Form c		1 Form a	
Contact Rating	Max. Switching Voltage	16 Vdc			
	Max. Switching Current	35 A (at 16 Vdc)			
	Contact Resistance	Typical 5 mΩ (measured at 1 A) Initial			
Contact Material		Silver oxide complex alloy			
Operate Time (Excluding Bounce)		Typical 3 ms (at Nominal Voltage)			
Release Time (Excluding Bounce) *		Typical 4 ms (at Nominal Voltage)			
Nominal Operate Power		640 mW	1000 mW		800 mW
Insulation Resistance		100 MΩ (at 500 Vdc)			
Breakdown Voltage	Between Open Contact	500 Vac min. (for 1 minute)			
	Between Coil and Contact	500 Vac min. (for 1 minute)			
Shock Resistance	Misoperation	98 m/s <sup>2</sup> (10 G)			
	Destructive Failure	980 m/s <sup>2</sup> (100 G)			
Vibration Resistance	Misoperation	10 to 300 Hz, 43 m/s <sup>2</sup> (4.4 G)			
	Destructive Failure	10 to 500 Hz, 43 m/s <sup>2</sup> (4.4 G) 200 hour			
Ambient Temperature		-40 to +85°C (-40 to 185°F)			
Coil Temperature Rise		60°C/W (108°F/W)			
Life Expectancy	Mechanical	1 × 10 <sup>6</sup> operations			
	Motor : 25 A lock	100 × 10 <sup>3</sup> operations		-	
	Lamp : 108 W Tungsten	-		100 × 10 <sup>3</sup> operations	
	Lamp : 120 W Halogen	-		100 × 10 <sup>3</sup> operations	
	LCR circuit : 70 A peak	-		100 × 10 <sup>3</sup> operations	
Weight		Approx. 9 g (0.32 oz)			

\* with diode

COIL RATING

◆ SEALED TYPE

(at 20°C)

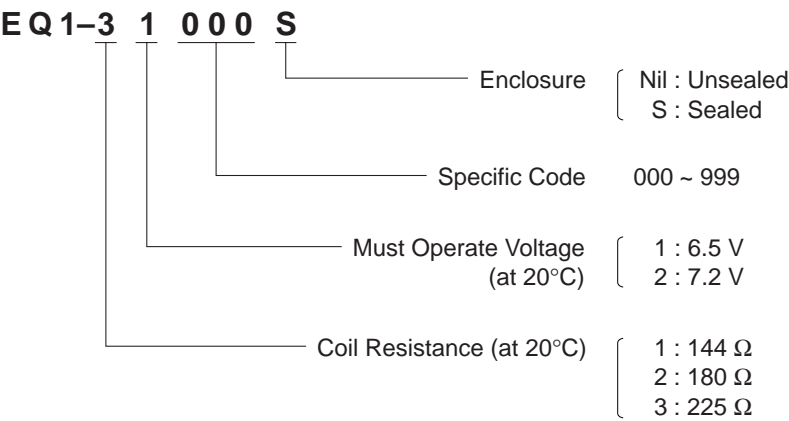
Items		Part Number	Nominal Voltage (Vdc)	Coil Resistance (Ω ±10%)	Must Operate Voltage (Vdc)	Must Release Voltage (Vdc)
Applications						
Motor Control	General-Purpose	EQ1-31000S	12	225	6.5	0.9
	For Jump Start	EQ1-11040S		144	6.5	0.6
Lamp and LCR circuit control		EQ1-22111S		180	7.2	0.9
		EQ1-11111S		144	6.5	0.6

◆ UNSEALED TYPE

(at 20°C)

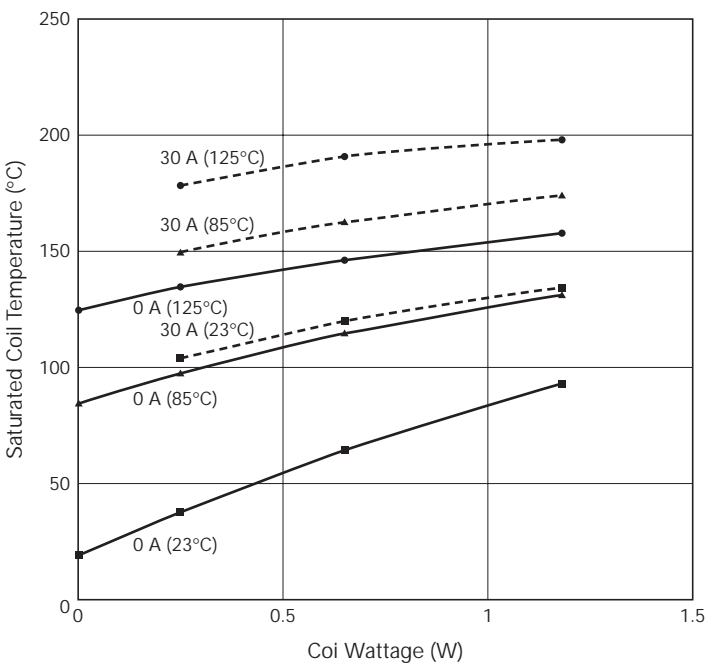
Items		Part Number	Nominal Voltage (Vdc)	Coil Resistance (Ω ±10%)	Must Operate Voltage (Vdc)	Must Release Voltage (Vdc)
Applications						
Motor Control	General-Purpose	EQ1-31000	12	225	6.5	0.9
	For Jump Start	EQ1-11040		144	6.5	0.6
Lamp and LCR circuit control		EQ1-22111		180	7.2	0.9
		EQ1-11111		144	6.5	0.6

NUMBERING SYSTEM



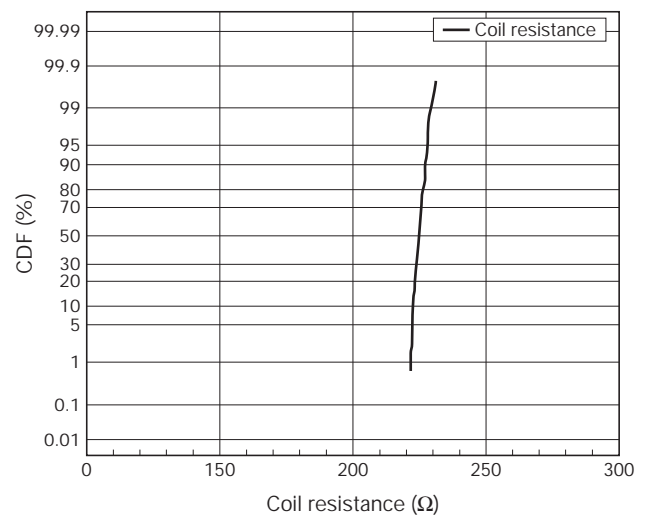
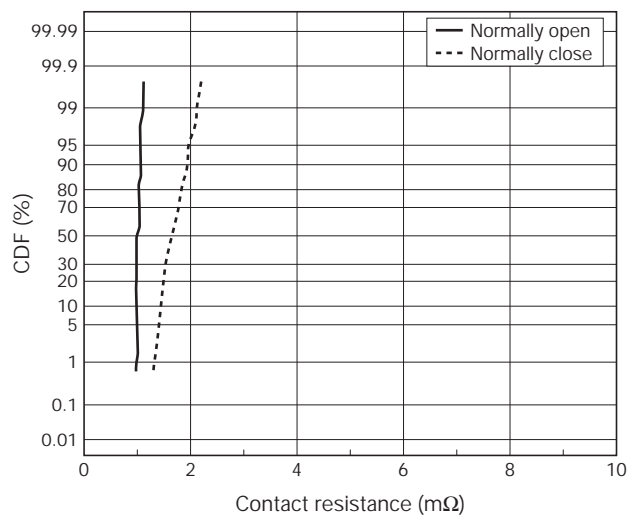
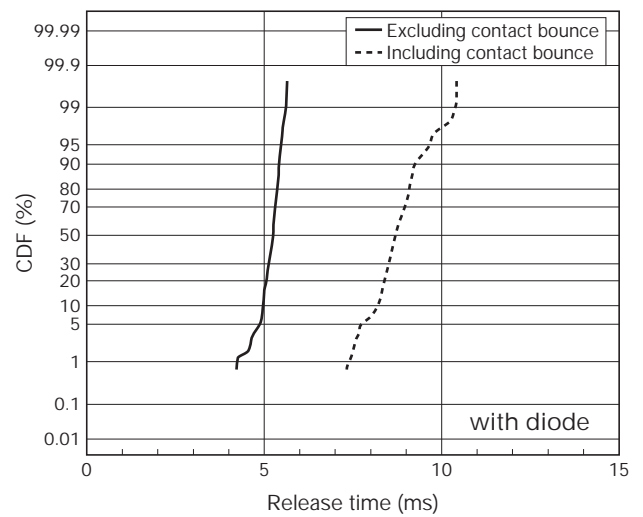
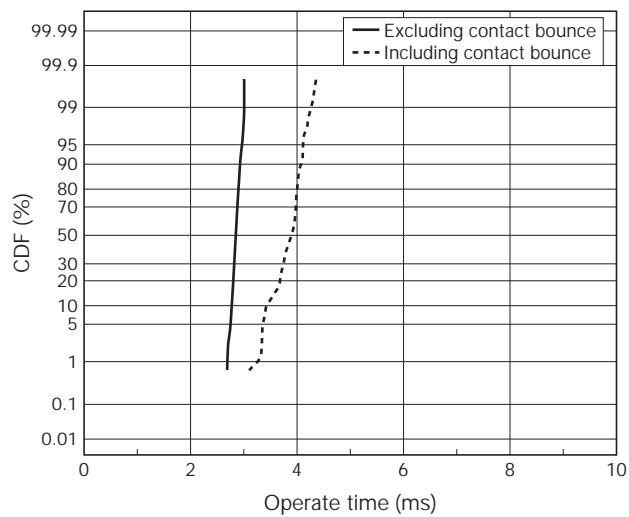
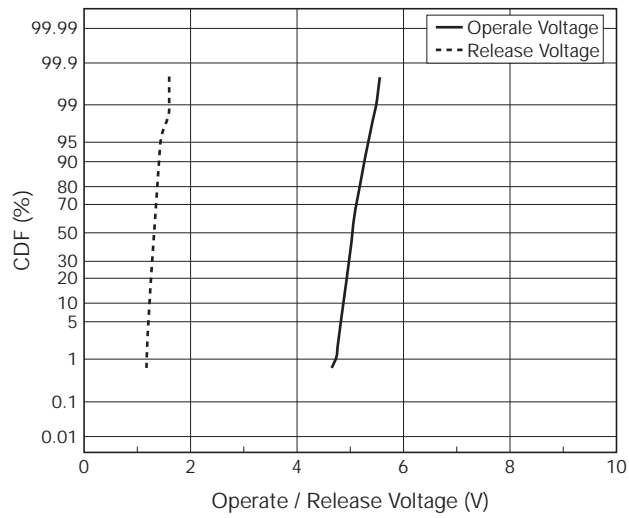
TECHNICAL DATA

Coil Temperature Rise

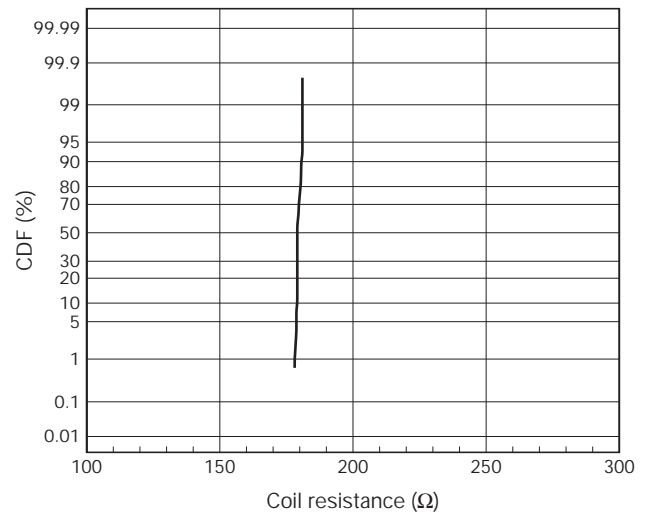
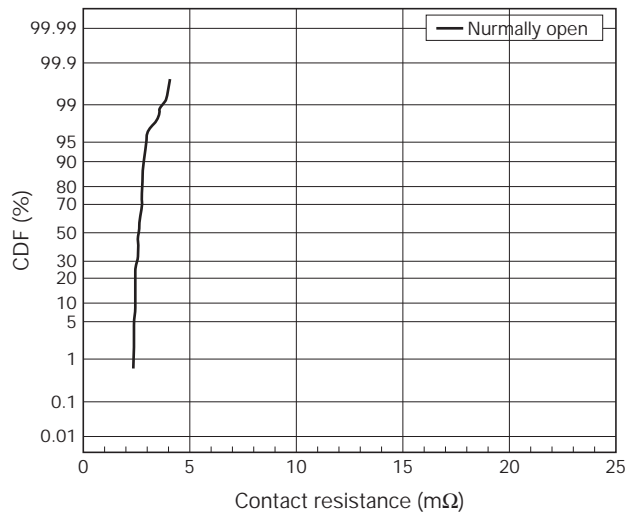
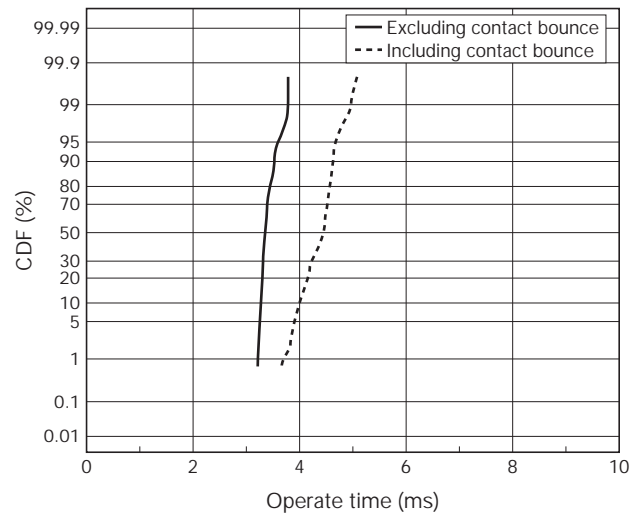
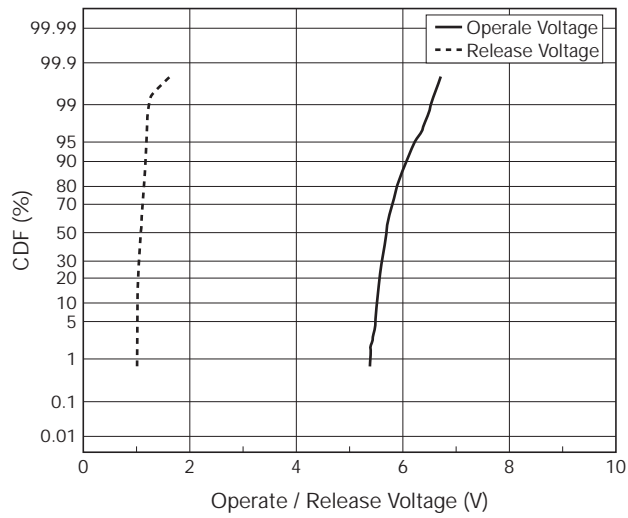


# RELAY CHARACTERISTICS DISTRIBUTION (INITIAL)

- EQ1-31000S
- 200 pieces



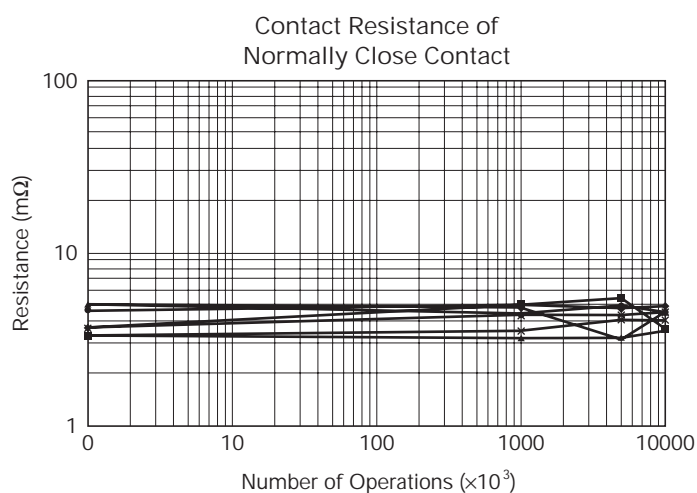
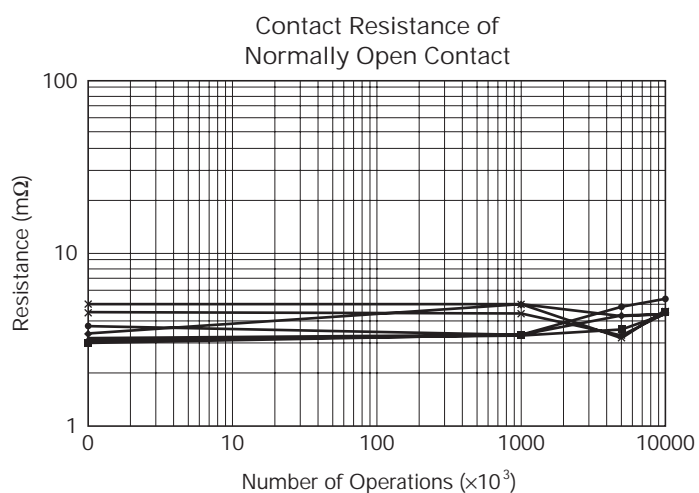
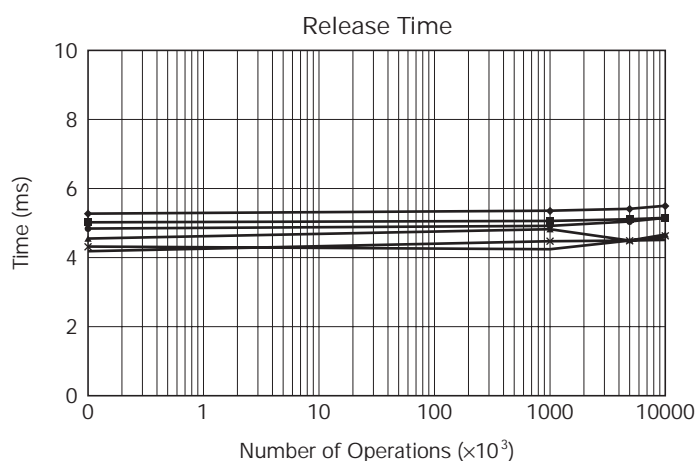
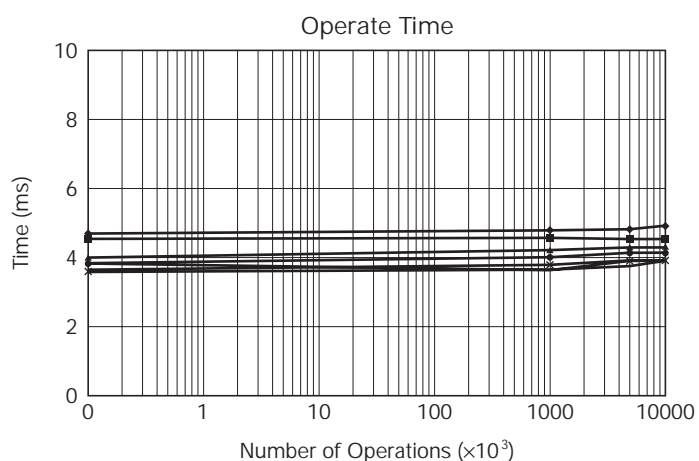
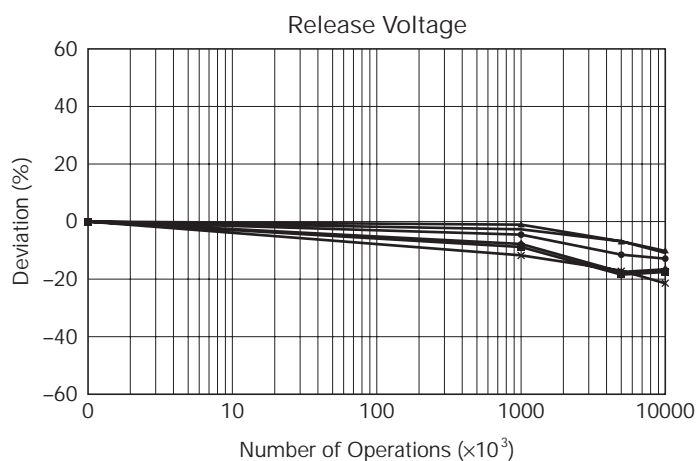
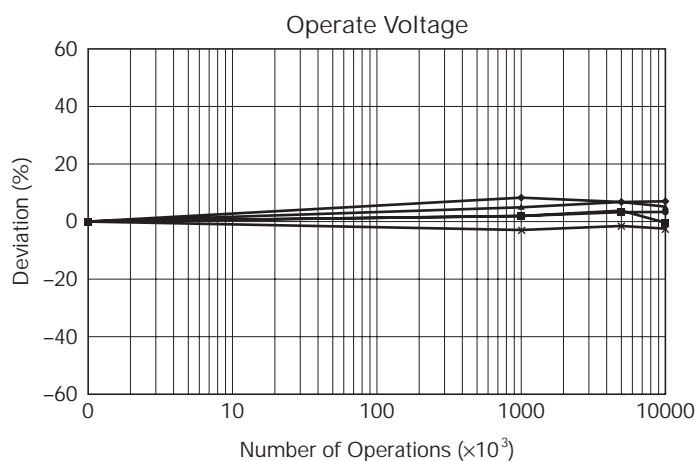
- EQ1-22111S
- 200 pieces



## DURABILITY LIFE

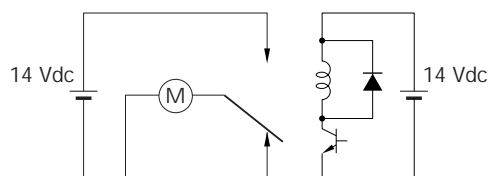
### Mechanical Life Test

- Ambient Temperature : 23°C
- Frequency : 12.5 Hz (50% duty)
- Contact Load : No Load
- Number of Operations :  $10 \times 10^6$
- Samples : EQ1-31000S 10 pieces

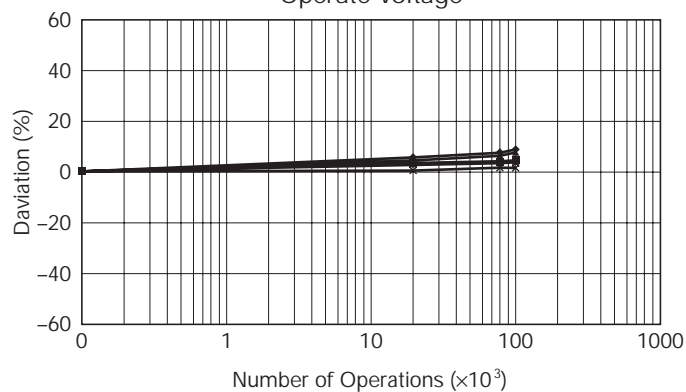


## Electrical Life Test 1

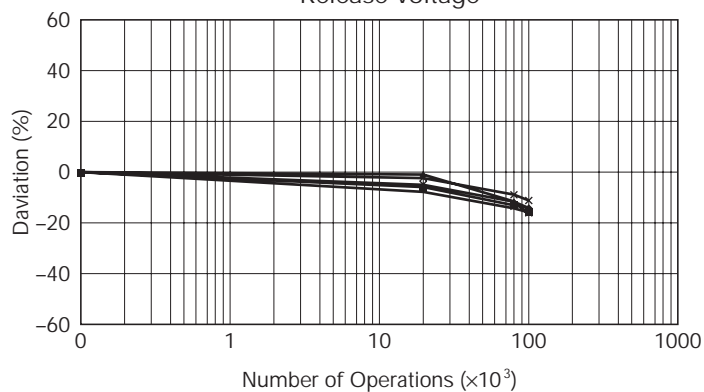
- Ambient Temperature : 23°C
- Frequency : 0.2s ON, 9.8s OFF, 0.1 Hz
- Contact Load : 14 Vdc, 25 A, Locked motor
- Number of Operations :  $200 \times 10^3$
- Samples : EQ1-31000S 10 pieces



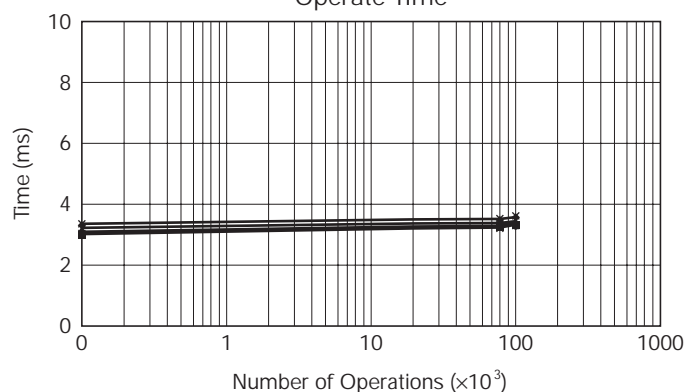
### Operate Voltage



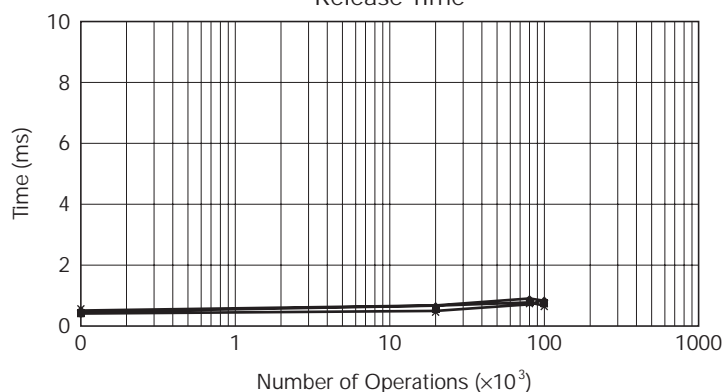
### Release Voltage



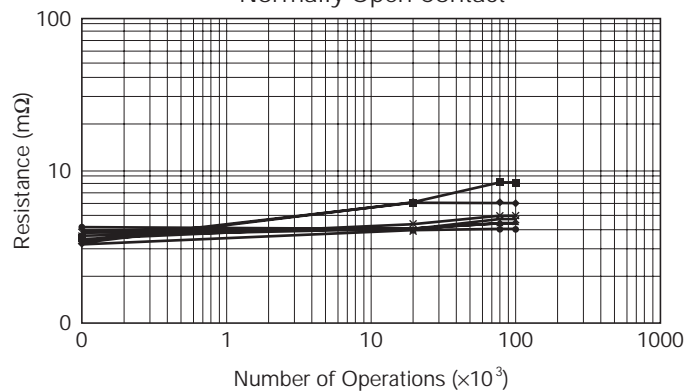
### Operate Time



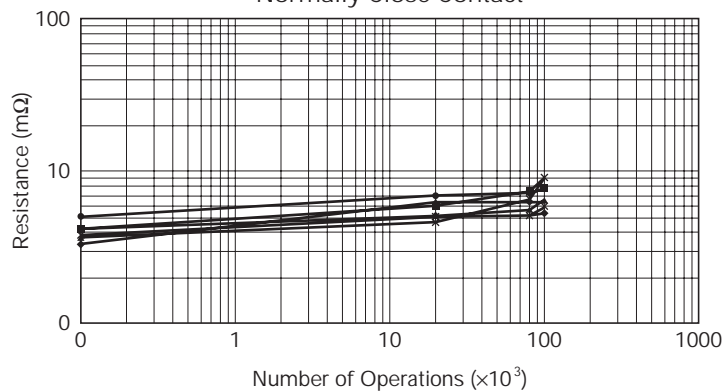
### Release Time



### Contact Resistance of Normally Open Contact



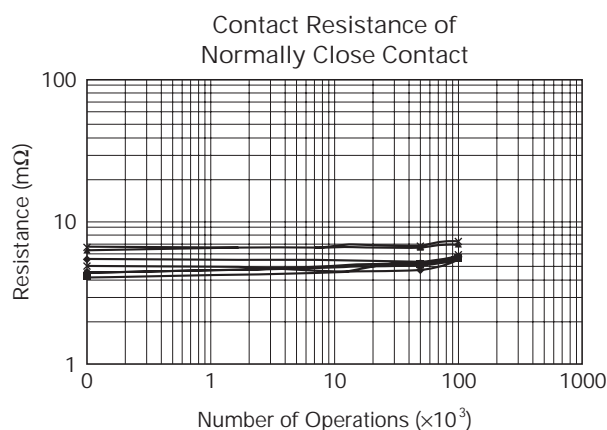
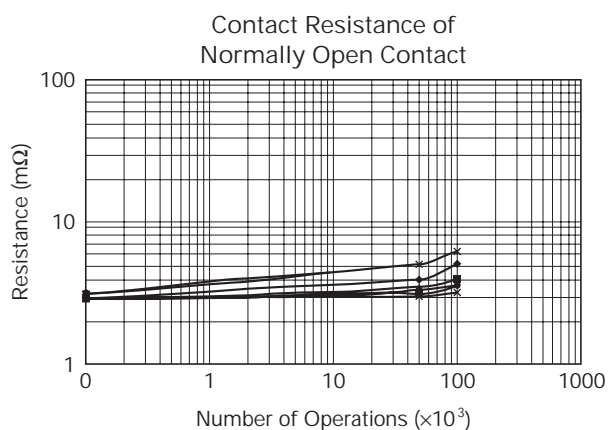
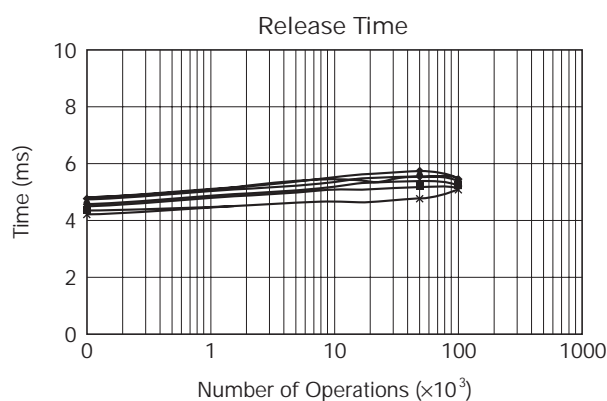
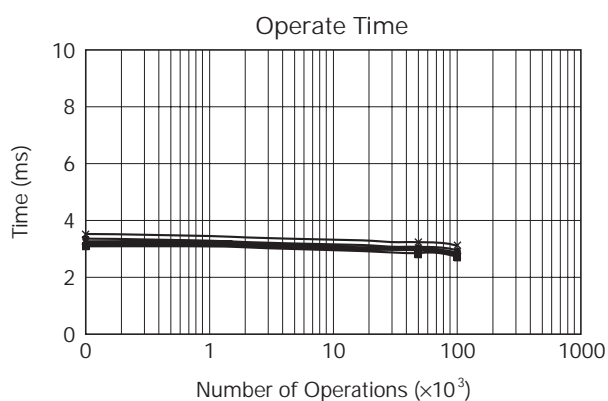
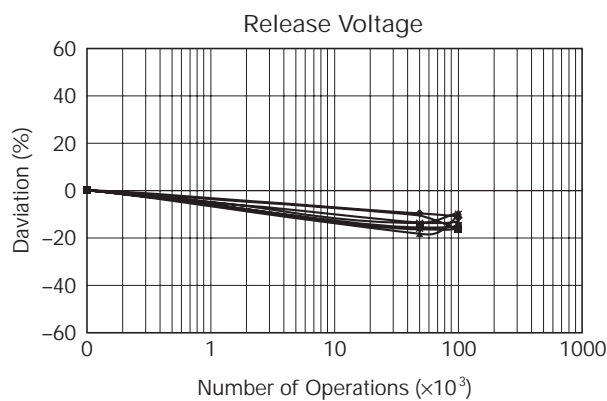
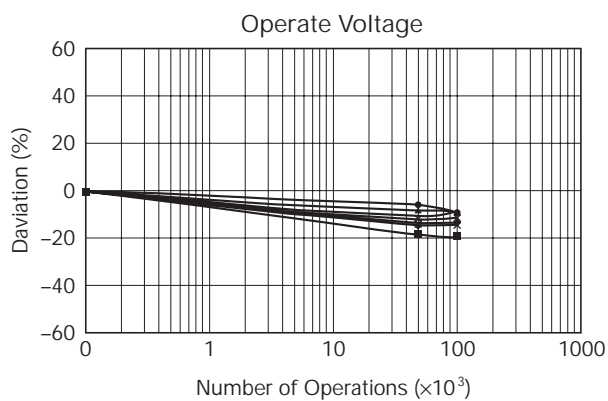
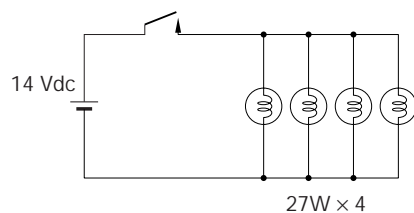
### Contact Resistance of Normally Close Contact





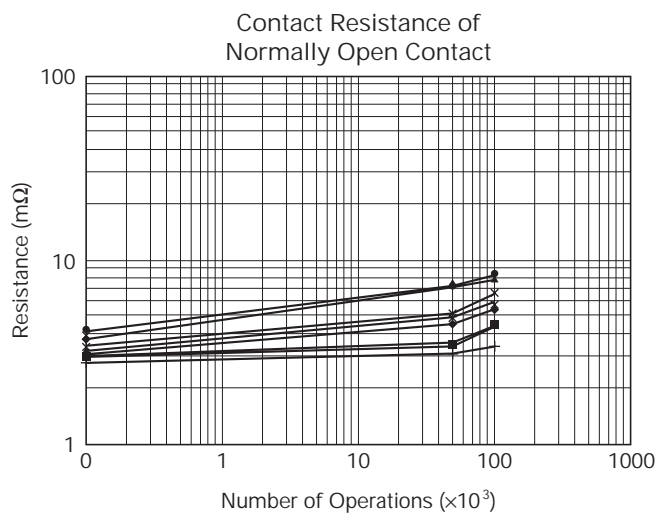
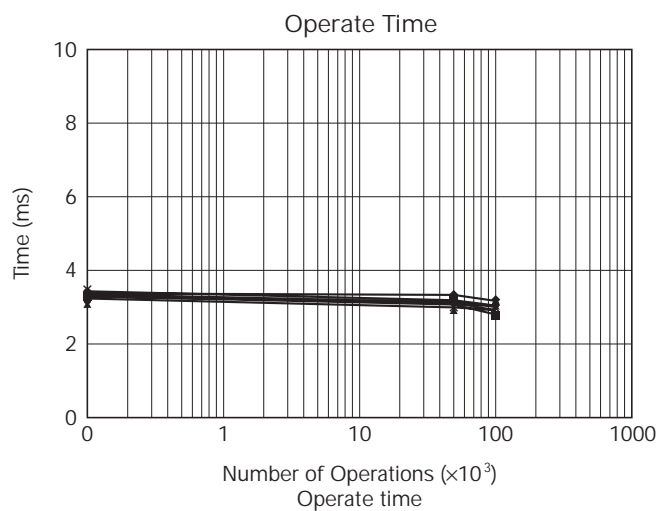
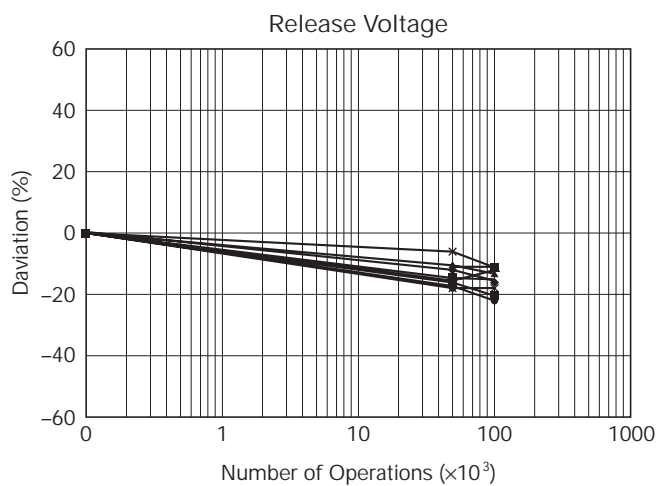
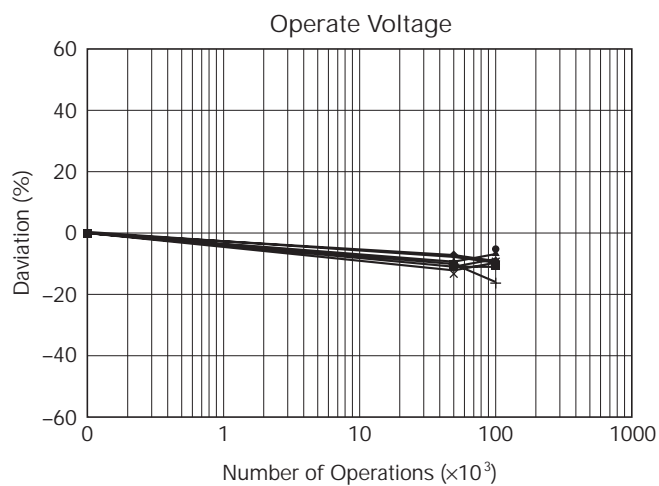
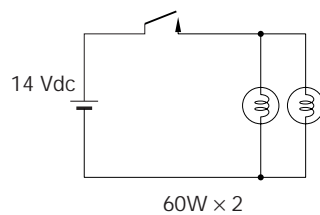
### Electrical Life Test 2

- Ambient Temperature : 23°C
- Frequency : 1s ON, 29s OFF
- Contact Load : 14 Vdc, 108 W, Tungsten Lamp
- Number of Operations :  $100 \times 10^3$
- Samples : EQ1-22111S 10 pieces



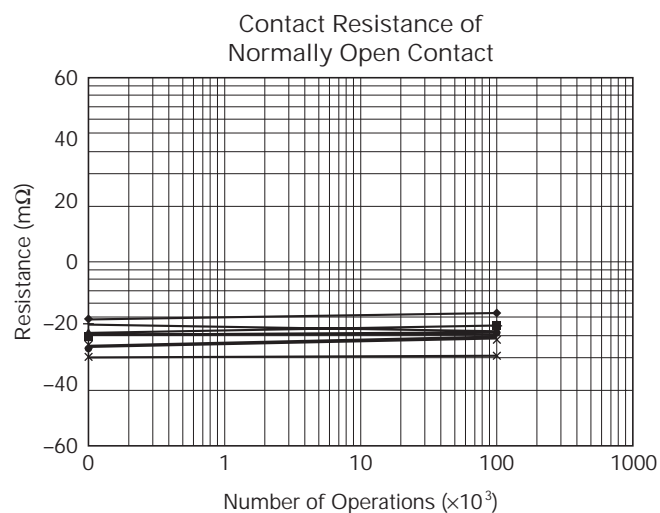
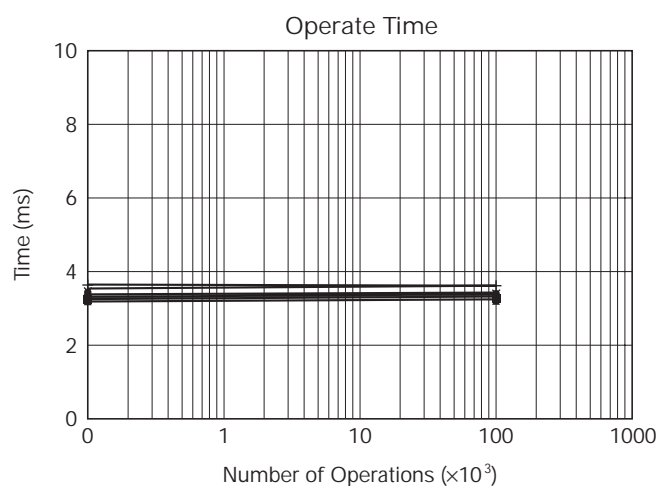
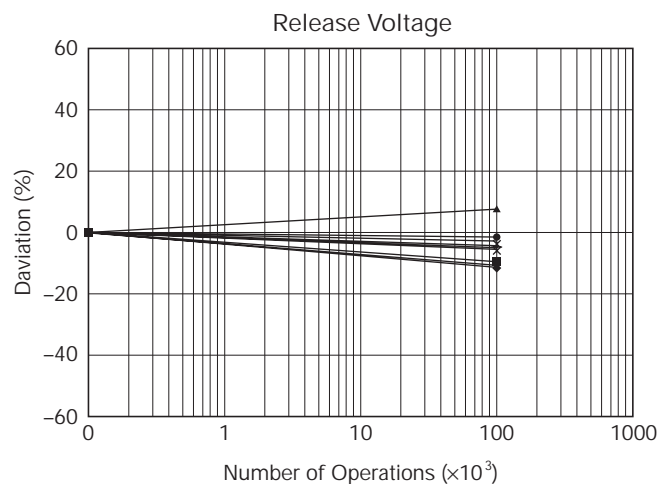
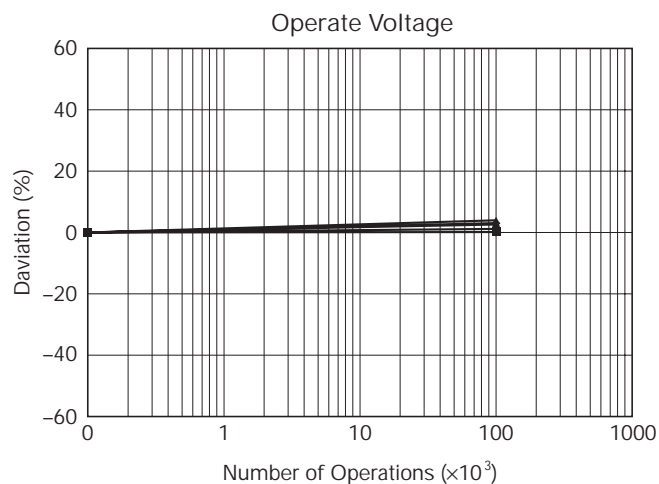
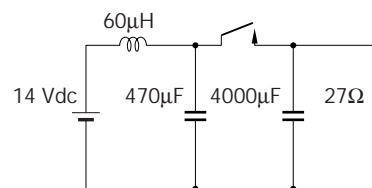
### Electrical Life Test 3

- Ambient temperature : 23°C
- Frequency : 1s ON, 29s OFF
- Contact load : 14 Vdc, 120 W, Halogen Lamp
- Number of operations :  $100 \times 10^3$
- Samples : EQ1-22111S, 10 pieces



Electrical Life Test 4

- Ambient temperature : 23°C
- Frequency : 20ms ON, 3.98s OFF
- Contact load : 14 Vdc, LCR circuit
- Number of operations :  $100 \times 10^3$
- Samples : EQ1-22111S, n=10



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NEC devices are classified into the following three quality grades:

"Standard", "Special", and "Specific". The Specific quality grade applies only to devices developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.

Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

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Anti-radioactive design is not implemented in this product.