

# AUTOMOTIVE RELAYS

## ET2/ET1 SERIES

### DESCRIPTION

The new NEC ET2/ET1 series is PC-board mount type automotive relay suitable for various motor and heater control applications that require a high quality and performance. The ET2/ET1 series is the relay that succeeds fundamental structure and performance of the NEC EP2/EP1 series that has the high share with a motor control usage of the automobile of the world. Besides the ET2/ET1 series is succeeding in about 50% of miniaturization in comparison with the EP2/EP1 series.

### FEATURES

- PC board mounting
- Approx. 50% relay volume of EP2/EP1
- Approx. 75% relay space of EP2/EP1
- Approx. 70% relay height of EP2/EP1
- Approx. 50% relay weight of EP2/EP1

### APPLICATIONS

- Motor control
- Heater control
- Solenoid control



Type ET2



Type ET1

#### 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/TOKIN's "Miniature Relays" (0123EMDD03VOL01E) before dose designing your relay applications.

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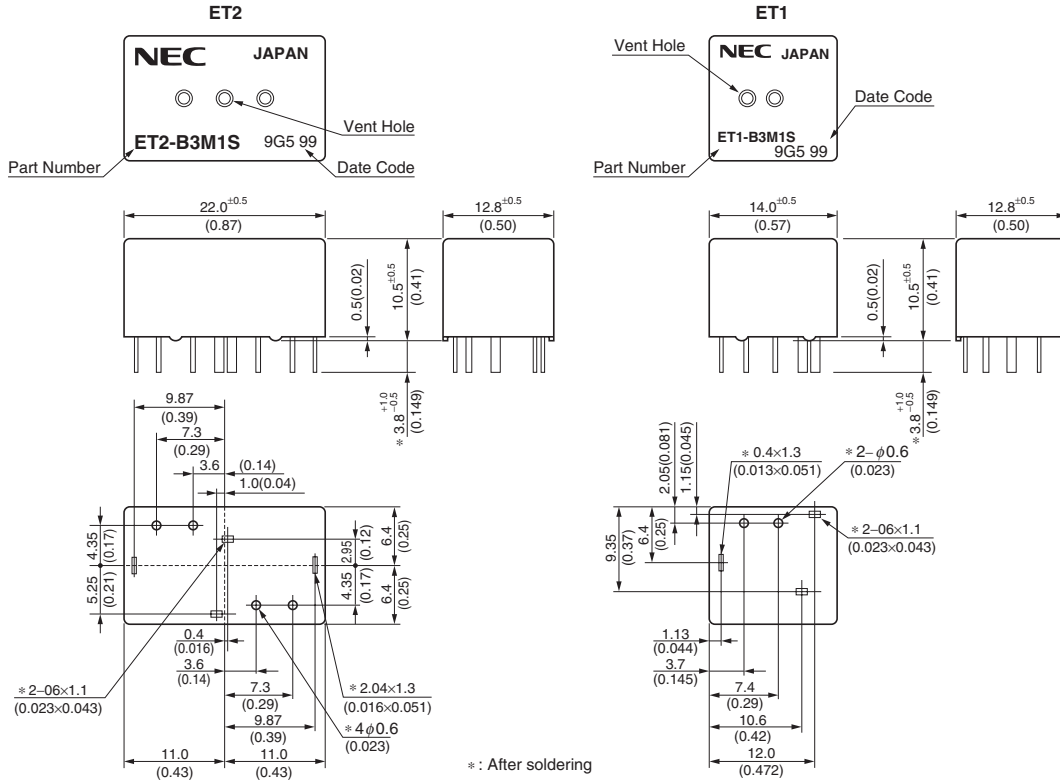


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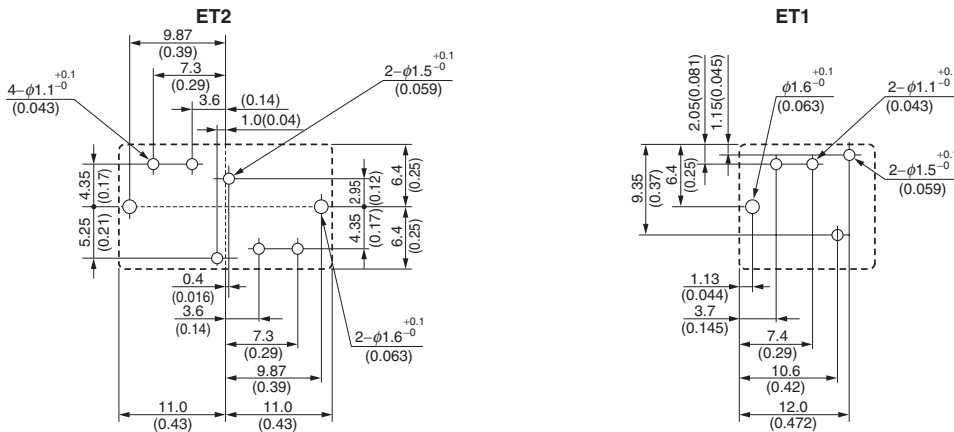
SCHMATIC (BOTTOM VIEW)



DIMENSIONS mm (inch)



PCB PAD LAYOUT mm (inch) (BOTTOM VIEW)



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**SPECIFICATIONS**

(at 20 °C)

Items		Types	
		Twin	Single
		ET2-B3M1/ET2-B3M1S	ET1-B3M1/ET1-B3M1S
Contact Form		1 Form c × 2 (H Bridge)	1 Form c
Contact Rating	Max. Switching Voltage	16 V dc	
	Max. Switching Current	25 A (at 16 Vdc)	
	Min. Switching Current	1 A (at 5 Vdc)	
	Contact Resistance	4 mΩ typical (measured at 7 A) Initial	
Contact Material		Silver oxide complex alloy	
Operate Time (Excluding Bounce)		2.5 ms typical (at Nominal Voltage) Initial	
Release Time (Excluding Bounce)		3 ms typical (at Nominal Voltage, with diode) Initial	
Nominal Operate Power		640 mW	
Insulation Resistance		100 MΩ at 500 V dc	
Breakdown Voltage	Between Open Contact	500 V ac min. (for 1 minute)	
	Between Coil and Contact	500 V ac 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 ~ 300 Hz, 43 m/s <sup>2</sup> (4.4 G)	
	Destructive Failure	10 ~ 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		70 °C (158 °F)/W	
Life Expectancy	Mechanical		1 × 10 <sup>6</sup> operations
	Electrical	Power Window Motor (14 V, 20 A, Locked)	100 × 10 <sup>3</sup> operations
		Power Window Motor (14 V, 20 A /3 A, Unlocked)	100 × 10 <sup>3</sup> operations
Weight		Approx. 7.5 g (0.26 oz)	Approx. 4.5 g (0.16 oz)

**COIL RATING**

**SEALED TYPE**

(at 20 °C)

Contact Form		Part Number	Nominal Voltage (Vdc)	Coil Resistance (Ω±10%)	Must Operate Voltage (Vdc)	Must Release Voltage (Vdc)
Twin	1 Form c × 2	ET2-B3M1S	12	225	6.5	0.9
Single	1 Form c	ET1-B3M1S				

**UNSEALED TYPE**

(at 20 °C)

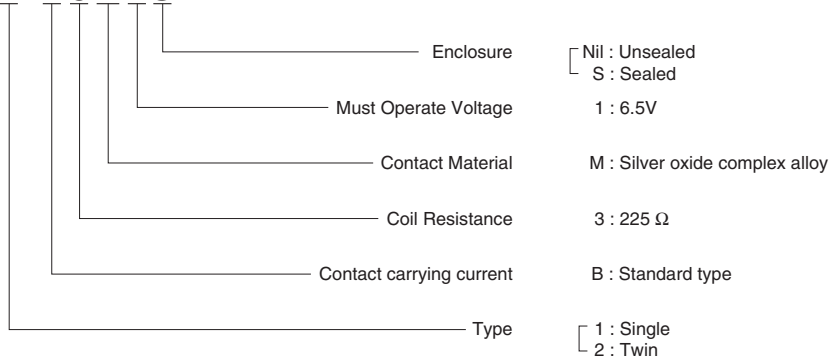
Contact Form		Part Number	Nominal Voltage (Vdc)	Coil Resistance (Ω±10%)	Must Operate Voltage (Vdc)	Must Release Voltage (Vdc)
Twin	1 Form c × 2	ET2-B3M1	12	225	6.5	0.9
Single	1 Form c	ET1-B3M1				



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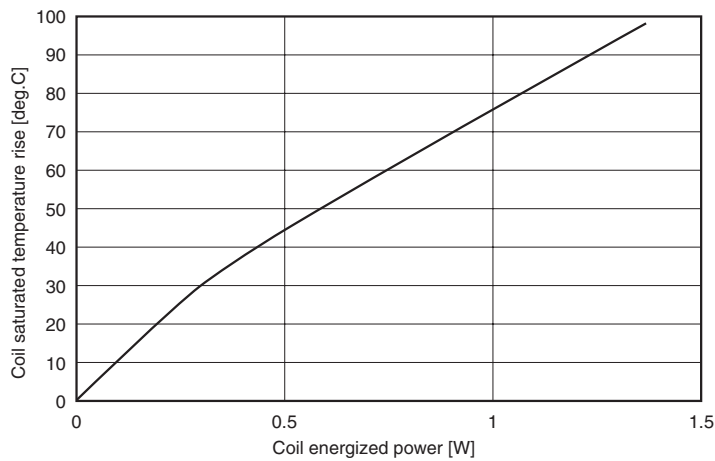
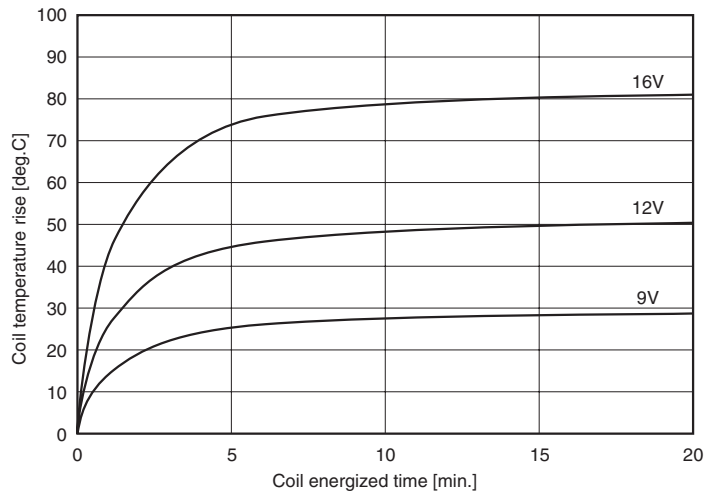
NUMBERING SYSTEM

**ET2-B3M1S**



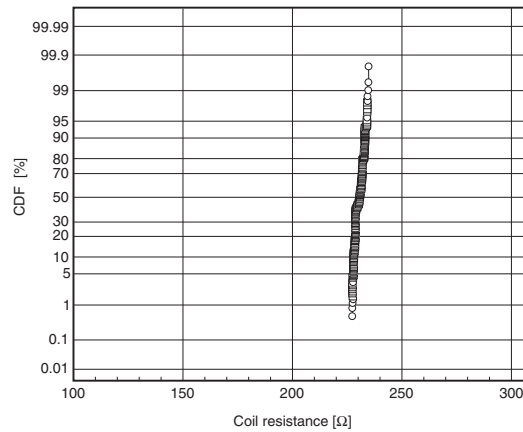
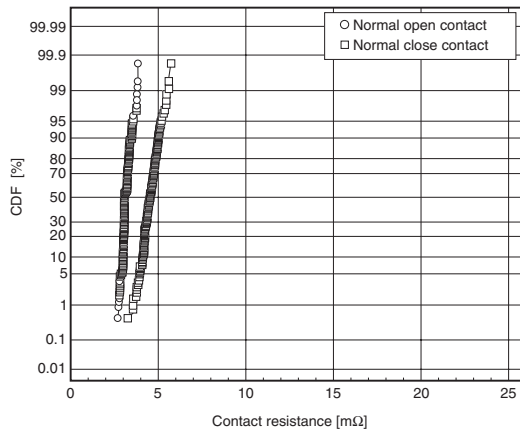
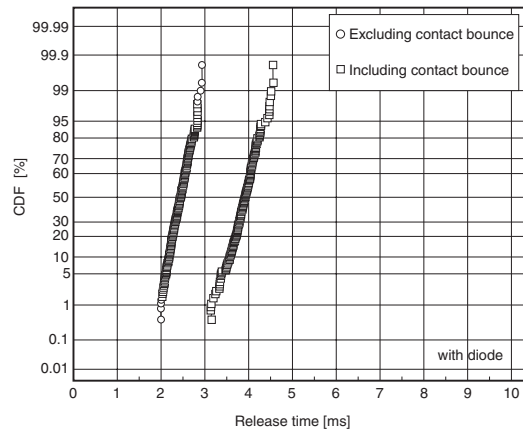
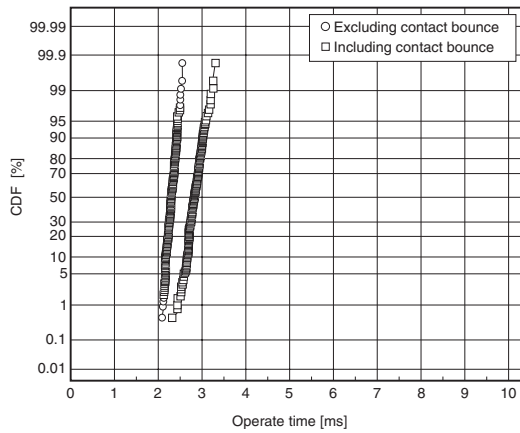
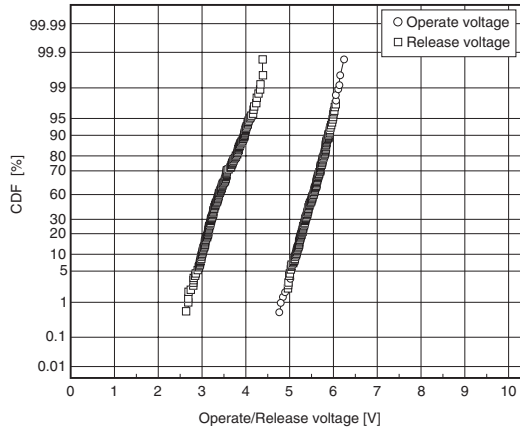
COIL TEMPERATURE RISE

Test piece : ET1-B3M1S



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RELAY CHARACTERISTICS DISTRIBUTION (INITIAL)

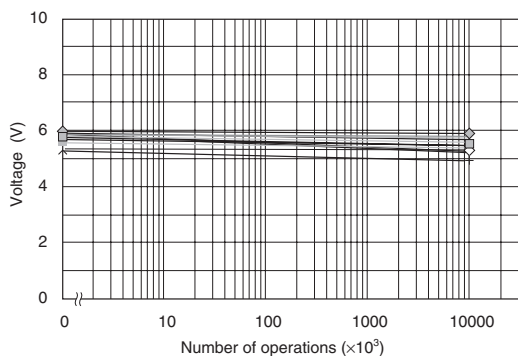


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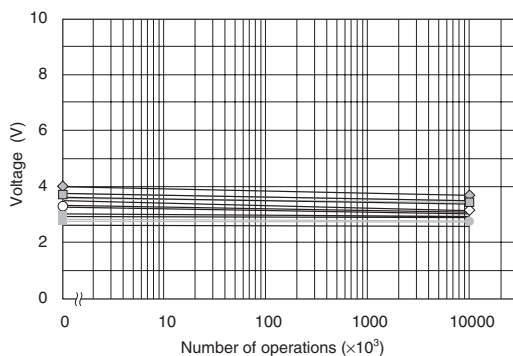
**DURABILITY LIFE**

Mechanical life test

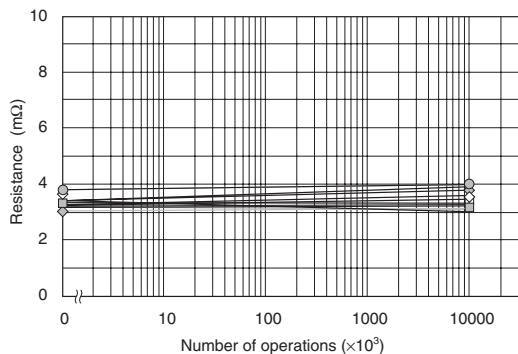
- Ambient temperature : 20 °C
- Frequency : 15 Hz (50 % duty)
- Contact load : No load
- Number of operations :  $10 \times 10^6$
- Samples : ET2-B3M1S 10 pieces



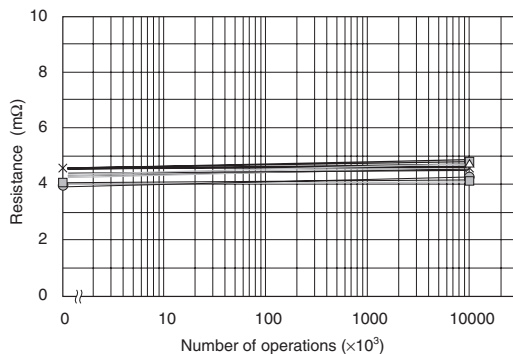
**Operate Voltage**



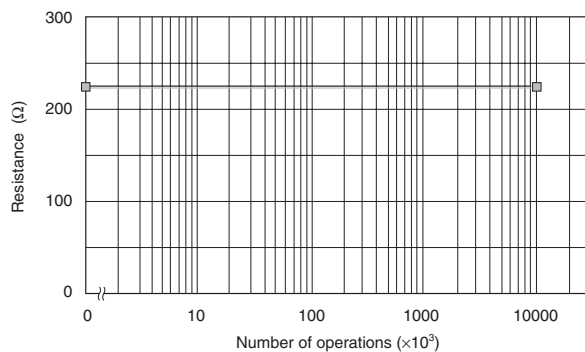
**Release Voltage**



**Contact Resistance (N.O contact)**



**Contact Resistance (N.C contact)**



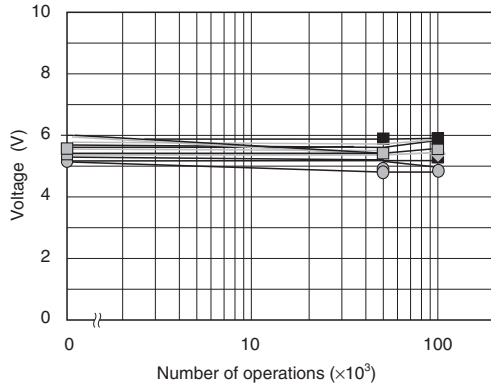
**Coil resistance**



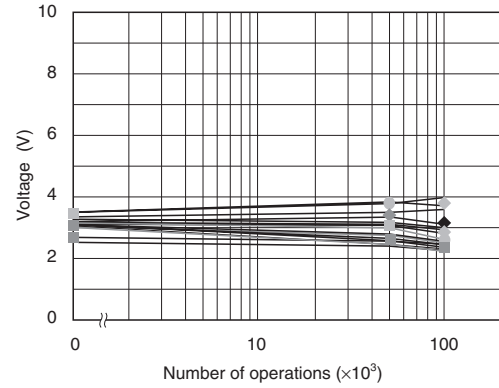
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Electrical life test (1)

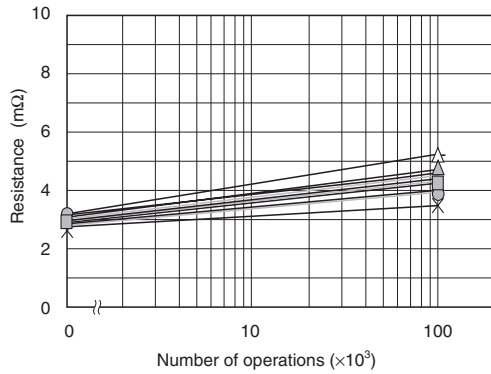
- Ambient temperature : 20 °C
- Frequency : 0.2s ON/9.8s OFF, 0.1 Hz
- Contact load : 14 VDC, 20A, Power window motor load, locked
- Number of operations :  $100 \times 10^3$
- Samples : ET2-B3M1S 10 pieces



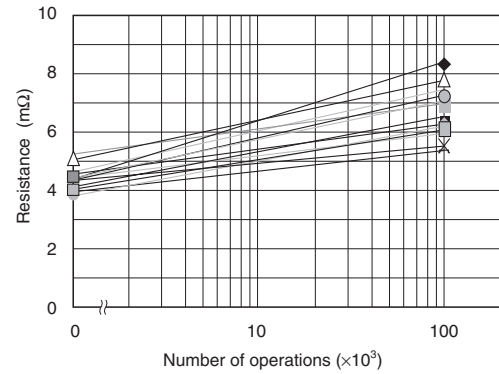
Operate Voltage



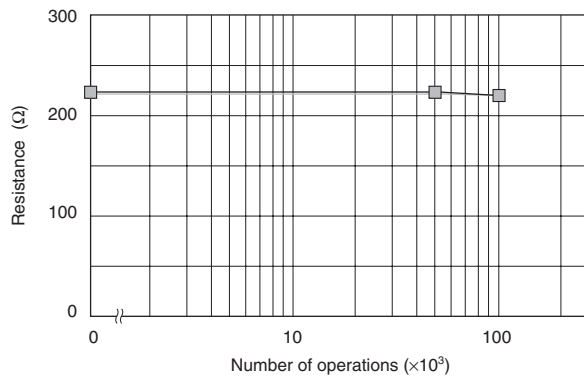
Release Voltage



Contact Resistance (N.O contact)



Contact Resistance (N.C contact)



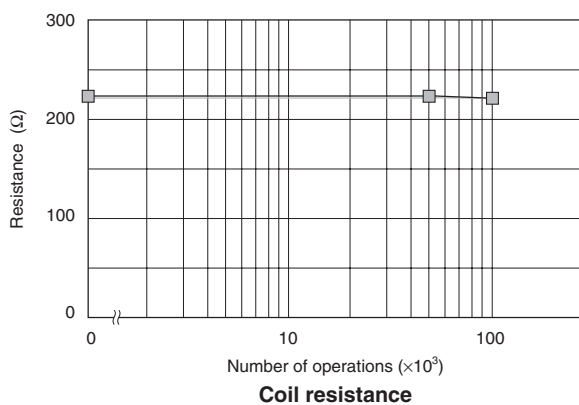
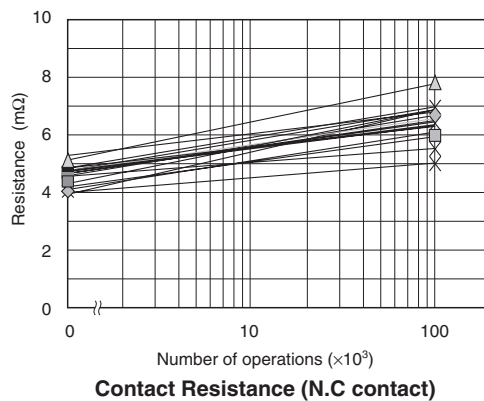
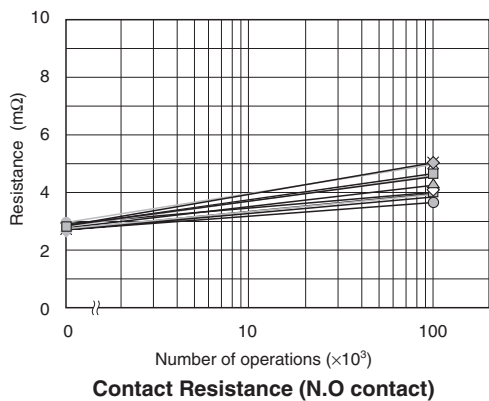
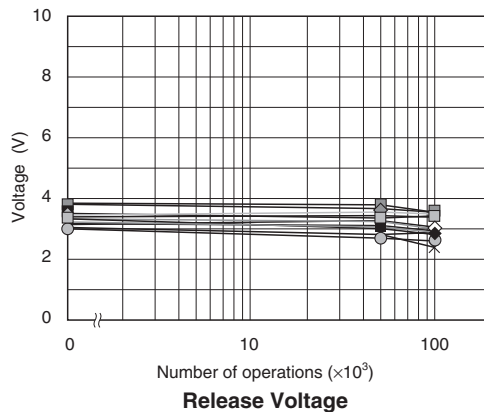
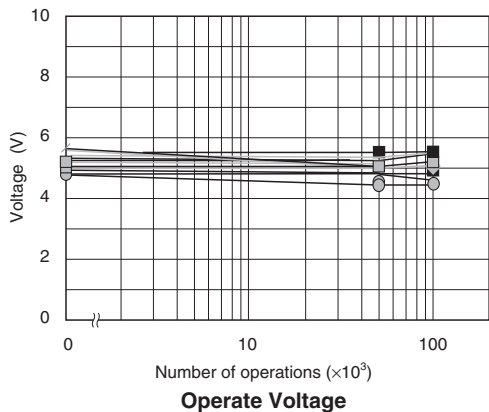
Coil resistance



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Electrical life test (2)

- Ambient temperature : 20 °C
- Frequency : 0.2s ON/9.8s OFF, 0.1 Hz
- Contact load : 14 VDC, 20A, Power window motor load, Unlocked
- Number of operations :  $100 \times 10^3$
- Samples : ET2-B3M1S 10 pieces



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[MEMO]



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"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.

The quality grade of NEC/TOKIN devices is "Standard" unless otherwise specified in NEC/TOKIN's Data Sheets or Data Books. If customers intend to use NEC/TOKIN devices for applications other than those specified for Standard quality grade, they should contact an NEC/TOKIN sales representative in advance.

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DE0202



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