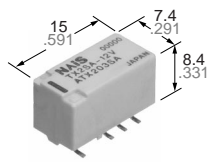
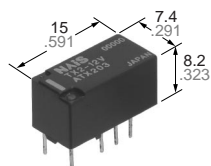


# NAIS

## 2 AMP. HIGH CAPACITY RELAY WITH HIGH SURGE VOLTAGE & HIGH BREAKDOWN VOLTAGE

# TX-RELAYS



mm inch

### FEATURES

- Breakdown voltage between contacts and coil: 2,000 V
- Surge withstand between contacts and coil: 2,500 V
- High contact capacity: 2 A 30 V DC
- Surface-mount type available

### SPECIFICATIONS

| Contact   |   |   |                   |
|---|---|---|-------------------|
| Arrangement   |   | 2 Form C                                    |                   |
| Initial contact resistance, max. (By voltage drop 6 V DC 1 A) |   | 100 mΩ                                      |                   |
| Contact material  |   | Gold-clad silver alloy                      |                   |
| Rating  | Nominal switching capacity (resistive load) | 2 A 30 V DC                                 |                   |
|   | Max. switching power (resistive load)       | 60 W  |                   |
|   | Max. switching voltage                      | 220 V DC                                    |                   |
|   | Max. switching current                      | 2 A   |                   |
|   | Min. switching capacity *1                  | 10 μA 10 mV DC                              |                   |
| Nominal operating power                                       | Single side stable                          | 140 mW (1.5 to 24 V DC)<br>270 mW (48 V DC) |                   |
|   | 1 coil latching                             | 100 mW (1.5 to 24 V DC)                     |                   |
|   | 2 coil latching                             | 200 mW (1.5 to 24 V DC)                     |                   |
| Expected life (min. operations)                               | Mechanical (at 180 cpm)                     | 10 <sup>8</sup>                             |                   |
|   | Electrical (at 20 cpm)                      | 2 A 30 V DC resistive                       | 10 <sup>5</sup>   |
|   |   | 1 A 30 V DC resistive                       | 5×10 <sup>5</sup> |

- Notes:**
- \*1 This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.
  - \*2 The upper limit for the ambient temperature is the maximum temperature that can satisfy the coil temperature rise. Under the packing condition, allowable temperature range is from -40 to +70°C -40°C to +158°F.

- Remarks**
- \* Specifications will vary with foreign standards certification ratings.
  - \*1 Measurement at same location as "Initial breakdown voltage" section.
  - \*2 By resistive method, nominal voltage applied to the coil; contact carrying current: 2 A.
  - \*3 Nominal voltage applied to the coil, excluding contact bounce time.
  - \*4 Nominal voltage applied to the coil, excluding contact bounce time without diode.
  - \*5 Half-wave pulse of sine wave: 6 ms; detection time: 10 μs.
  - \*6 Half-wave pulse of sine wave: 6 ms.
  - \*7 Detection time: 10 μs.
  - \*8 Refer to 4. Conditions for operation, transport and storage mentioned in Cautions for use (Page 178).

| Characteristics  |                                     |  |
|--|-------------------------------------|--|
| Initial insulation resistance*1  |                                     | Min. 1,000 MΩ (at 500 V DC)  |
| Initial breakdown voltage  | Between open contacts               | 1,000 Vrms for 1 min. (Detection current: 10 mA)   |
|  | Between contact sets                | 1,000 Vrms for 1 min. (Detection current: 10 mA)   |
|  | Between contact and coil            | 2,000 Vrms for 1 min. (Detection current: 10 mA)   |
| Initial surge voltage  | Between open contacts (10×160 μs)   | 1,500 V (FCC Part 68)  |
|  | Between contacts and coil (2×10 μs) | 2,500 V (Bellcore)   |
| Temperature rise*2 (at 20°C)   |                                     | Max. 50°C  |
| Operate time [Set time]*3 (at 20°C)  |                                     | Max. 4 ms (Approx. 2 ms)<br>[Max. 4 ms (Approx. 2 ms)]   |
| Release time [Reset time]*4 (at 20°C)  |                                     | Max. 4 ms (Approx. 1 ms)<br>[Max. 4 ms (Approx. 2 ms)]   |
| Shock resistance   | Functional*5                        | Min. 750 m/s <sup>2</sup> {75 G}   |
|  | Destructive*6                       | Min. 1,000 m/s <sup>2</sup> {100 G}  |
| Vibration resistance   | Functional*7                        | 196 m/s <sup>2</sup> {20 G}, 10 to 55 Hz at double amplitude of 3.3 mm   |
|  | Destructive                         | 294 m/s <sup>2</sup> {30G}, 10 to 55 Hz at double amplitude of 5 mm  |
| Conditions for operation, transport and storage*8 (Not freezing and condensing at low temperature) | Ambient temperature *2              | -40°C to +85°C (up to 24 V coil)<br>-40°F to +185°F (up to 24 V coil)<br>-40°C to +70°C (48 V coil)<br>-40°F to +158°F (48 V coil) |
|  | Humidity                            | 5 to 85% R.H.  |
| Unit weight  |                                     | Approx. 2 g .071 oz  |

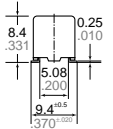
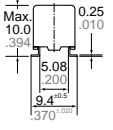
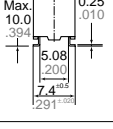
### ORDERING INFORMATION

Ex. TX 2 SA - L - H - 3V - Z

| Contact arrangement | Surface-mount availability  | Operating function   | Terminal shape  | Coil voltage (DC)                   | Packing style  |
|---------------------|---|--|---|-------------------------------------|--|
| 2: 2 Form C         | Nil: Standard PC board terminal type or self-clinching terminal type<br>SA: Standard surface-mount terminal type<br>SL: High connection reliability surface-mount terminal type<br>SS: Space saving surface-mount terminal type | Nil: Single side stable<br>L: 1 coil latching<br>L2: 2 coil latching | Nil: Standard PC board terminal or surface-mount terminal<br>H: Self-clinching terminal | 1.5, 3, 4.5, 5, 6, 9, 12, 24, 48* V | Nil: Tube packing<br>Z: Tape and reel packing (picked from the 8/9/10/12-pin side) |

- Notes: 1. Tape and reel (picked from 1/3/4/5-pin side) is also available by request. Part number suffix "-X" is needed when ordering. (ex.) TX2SA-3 V-X
2. Tape and reel packing symbol "-Z" or "-X" are not marked on the relay.
- \*48 V coil type: Single side stable only

## Surface-mount terminal variation

| Variation  | Terminal style  | Usable conditions based on terminal connection solder reliability |  |
|--|---|---|--|
|  |   | Normal environments (indoor)                                      | Drastic temperature fluctuations (outdoor) |
| SA type<br>(Standard surface-mount terminal type)                      |  | Recommended   | —  |
| SL type<br>(Highly connection reliability surface-mount terminal type) |  | Recommended   | Recommended                                |
| SS type<br>(Space saving surface-mount terminal type)                  |  | Recommended   | Recommended                                |

## TYPES AND COIL DATA (at 20°C 68°F)

### 1) Standard PC board terminal type and self-clinching terminal type

#### 1. Single side stable

| Part No.                   |                         | Nominal voltage, V DC | Pick-up voltage, V DC (max.) | Drop-out voltage, V DC (min.) | Nominal operating current, mA (±10%) | Coil resistance, Ω (±10%) | Nominal operating power, mW | Max. allowable voltage, V DC |
|----------------------------|-------------------------|-----------------------|------------------------------|-------------------------------|--------------------------------------|---------------------------|-----------------------------|------------------------------|
| Standard PC board terminal | Self-clinching terminal |                       |                              |                               |                                      |                           |                             |                              |
| TX2-1.5 V                  | TX2-H-1.5 V             | 1.5                   | 1.13                         | 0.15                          | 93.8                                 | 16                        | 140                         | 2.2                          |
| TX2-3 V                    | TX2-H-3 V               | 3                     | 2.25                         | 0.3                           | 46.7                                 | 64.3                      | 140                         | 4.5                          |
| TX2-4.5 V                  | TX2-H-4.5 V             | 4.5                   | 3.38                         | 0.45                          | 31                                   | 145                       | 140                         | 6.7                          |
| TX2-5 V                    | TX2-H-5 V               | 5                     | 3.75                         | 0.5                           | 28.1                                 | 178                       | 140                         | 7.5                          |
| TX2-6 V                    | TX2-H-6 V               | 6                     | 4.5                          | 0.6                           | 23.3                                 | 257                       | 140                         | 9                            |
| TX2-9 V                    | TX2-H-9 V               | 9                     | 6.75                         | 0.9                           | 15.5                                 | 579                       | 140                         | 13.5                         |
| TX2-12 V                   | TX2-H-12 V              | 12                    | 9                            | 1.2                           | 11.7                                 | 1,028                     | 140                         | 18                           |
| TX2-24 V                   | TX2-H-24 V              | 24                    | 18                           | 2.4                           | 5.8                                  | 4,114                     | 140                         | 36                           |
| TX2-48 V                   | TX2-H-48 V              | 48                    | 36                           | 4.8                           | 5.6                                  | 8,533                     | 270                         | 57.6                         |

#### 2. 1 Coil latching

| Part No.                   |                         | Nominal voltage, V DC | Set voltage, V DC (max.) | Reset voltage, V DC (max.) | Nominal operating current, mA (±10%) | Coil resistance, Ω (±10%) | Nominal operating power, mW | Max. allowable voltage, V DC |
|----------------------------|-------------------------|-----------------------|--------------------------|----------------------------|--------------------------------------|---------------------------|-----------------------------|------------------------------|
| Standard PC board terminal | Self-clinching terminal |                       |                          |                            |                                      |                           |                             |                              |
| TX2-L-1.5 V                | TX2-L-H-1.5 V           | 1.5                   | 1.13                     | 1.13                       | 66.7                                 | 22.5                      | 100                         | 2.2                          |
| TX2-L-3 V                  | TX2-L-H-3 V             | 3                     | 2.25                     | 2.25                       | 33.3                                 | 90                        | 100                         | 4.5                          |
| TX2-L-4.5 V                | TX2-L-H-4.5 V           | 4.5                   | 3.38                     | 3.38                       | 22.2                                 | 202.5                     | 100                         | 6.7                          |
| TX2-L-5 V                  | TX2-L-H-5 V             | 5                     | 3.75                     | 3.75                       | 20                                   | 250                       | 100                         | 7.5                          |
| TX2-L-6 V                  | TX2-L-H-6 V             | 6                     | 4.5                      | 4.5                        | 16.7                                 | 360                       | 100                         | 9                            |
| TX2-L-9 V                  | TX2-L-H-9 V             | 9                     | 6.75                     | 6.75                       | 11.1                                 | 810                       | 100                         | 13.5                         |
| TX2-L-12 V                 | TX2-L-H-12 V            | 12                    | 9                        | 9                          | 8.3                                  | 1,440                     | 100                         | 18                           |
| TX2-L-24 V                 | TX2-L-H-24 V            | 24                    | 18                       | 18                         | 4.2                                  | 5,760                     | 100                         | 36                           |

#### 3. 2 Coil latching

| Part No.                   |                         | Nominal voltage, V DC | Set voltage, V DC (max.) | Reset voltage, V DC (max.) | Nominal operating current, mA (±10%) | Coil resistance, Ω (±10%) | Nominal operating power, mW | Max. allowable voltage, V DC |
|----------------------------|-------------------------|-----------------------|--------------------------|----------------------------|--------------------------------------|---------------------------|-----------------------------|------------------------------|
| Standard PC board terminal | Self-clinching terminal |                       |                          |                            |                                      |                           |                             |                              |
| TX2-L2-1.5 V               | TX2-L2-H-1.5 V          | 1.5                   | 1.13                     | 1.13                       | 133.9                                | 11.2                      | 200                         | 2.2                          |
| TX2-L2-3 V                 | TX2-L2-H-3 V            | 3                     | 2.25                     | 2.25                       | 66.7                                 | 45                        | 200                         | 4.5                          |
| TX2-L2-4.5 V               | TX2-L2-H-4.5 V          | 4.5                   | 3.38                     | 3.38                       | 44.5                                 | 101.2                     | 200                         | 6.7                          |
| TX2-L2-5 V                 | TX2-L2-H-5 V            | 5                     | 3.75                     | 3.75                       | 40                                   | 125                       | 200                         | 7.5                          |
| TX2-L2-6 V                 | TX2-L2-H-6 V            | 6                     | 4.5                      | 4.5                        | 33.3                                 | 180                       | 200                         | 9                            |
| TX2-L2-9 V                 | TX2-L2-H-9 V            | 9                     | 6.75                     | 6.75                       | 22.2                                 | 405                       | 200                         | 13.5                         |
| TX2-L2-12 V                | TX2-L2-H-12 V           | 12                    | 9                        | 9                          | 16.7                                 | 720                       | 200                         | 18                           |
| TX2-L2-24 V                | TX2-L2-H-24 V           | 24                    | 18                       | 18                         | 8.3                                  | 2,880                     | 200                         | 36                           |

#### Notes:

1. Specified value of pick-up, drop-out, set and reset voltage is with the condition of square wave coil pulse.

2. Standard packing: Tube: 40 pcs.; Case: 1,000 pcs.

3. In case of 5 V transistor drive circuit, it is recommended to use 4.5 V type relay.

## 2) Surface-mount terminal type

## 1. Single side stable

| Part No.    | Nominal voltage, V DC | Pick-up voltage, V DC (max.) | Drop-out voltage, V DC (min.) | Nominal operating current, mA ( $\pm 10\%$ ) | Coil resistance, $\Omega$ ( $\pm 10\%$ ) | Nominal operating power, mW | Max. allowable voltage, V DC |
|-------------|-----------------------|------------------------------|-------------------------------|--|--|-----------------------------|------------------------------|
| TX2SO-1.5 V | 1.5                   | 1.13                         | 0.15                          | 93.8   | 16                                       | 140                         | 2.2                          |
| TX2SO-3 V   | 3                     | 2.25                         | 0.3                           | 46.7   | 64.3                                     | 140                         | 4.5                          |
| TX2SO-4.5 V | 4.5                   | 3.38                         | 0.45                          | 31   | 145                                      | 140                         | 6.7                          |
| TX2SO-5 V   | 5                     | 3.75                         | 0.5                           | 28.1   | 178                                      | 140                         | 7.5                          |
| TX2SO-6 V   | 6                     | 4.5                          | 0.6                           | 23.3   | 257                                      | 140                         | 9                            |
| TX2SO-9 V   | 9                     | 6.75                         | 0.9                           | 15.5   | 579                                      | 140                         | 13.5                         |
| TX2SO-12 V  | 12                    | 9                            | 1.2                           | 11.7   | 1,028                                    | 140                         | 18                           |
| TX2SO-24 V  | 24                    | 18                           | 2.4                           | 5.8  | 4,114                                    | 140                         | 36                           |
| TX2SO-48 V  | 48                    | 36                           | 4.8                           | 5.6  | 8,533                                    | 270                         | 57.6                         |

## 2. 1 coil latching

| Part No.      | Nominal voltage, V DC | Set voltage, V DC (max.) | Reset voltage, V DC (max.) | Nominal operating current, mA ( $\pm 10\%$ ) | Coil resistance, $\Omega$ ( $\pm 10\%$ ) | Nominal operating power, mW | Max. allowable voltage, V DC |
|---------------|-----------------------|--------------------------|----------------------------|--|--|-----------------------------|------------------------------|
| TX2SO-L-1.5 V | 1.5                   | 1.13                     | 1.13                       | 66.7   | 22.5                                     | 100                         | 2.2                          |
| TX2SO-L-3 V   | 3                     | 2.25                     | 2.25                       | 33.3   | 90                                       | 100                         | 4.5                          |
| TX2SO-L-4.5 V | 4.5                   | 3.38                     | 3.38                       | 22.2   | 202.5                                    | 100                         | 6.7                          |
| TX2SO-L-5 V   | 5                     | 3.75                     | 3.75                       | 20   | 250                                      | 100                         | 7.5                          |
| TX2SO-L-6 V   | 6                     | 4.5                      | 4.5                        | 16.7   | 360                                      | 100                         | 9                            |
| TX2SO-L-9 V   | 9                     | 6.75                     | 6.75                       | 11.1   | 810                                      | 100                         | 13.5                         |
| TX2SO-L-12 V  | 12                    | 9                        | 9                          | 8.3  | 1,440                                    | 100                         | 18                           |
| TX2SO-L-24 V  | 24                    | 18                       | 18                         | 4.2  | 5,760                                    | 100                         | 36                           |

## 3. 2 coil latching

| Part No.       | Nominal voltage, V DC | Set voltage, V DC (max.) | Reset voltage, V DC (max.) | Nominal operating current, mA ( $\pm 10\%$ ) | Coil resistance, $\Omega$ ( $\pm 10\%$ ) | Nominal operating power, mW | Max. allowable voltage, V DC |
|----------------|-----------------------|--------------------------|----------------------------|--|--|-----------------------------|------------------------------|
| TX2SO-L2-1.5 V | 1.5                   | 1.13                     | 1.13                       | 133.9  | 11.2                                     | 200                         | 2.2                          |
| TX2SO-L2-3 V   | 3                     | 2.25                     | 2.25                       | 66.7   | 45                                       | 200                         | 4.5                          |
| TX2SO-L2-4.5 V | 4.5                   | 3.38                     | 3.38                       | 44.5   | 101.2                                    | 200                         | 6.7                          |
| TX2SO-L2-5 V   | 5                     | 3.75                     | 3.75                       | 40   | 125                                      | 200                         | 7.5                          |
| TX2SO-L2-6 V   | 6                     | 4.5                      | 4.5                        | 33.3   | 180                                      | 200                         | 9                            |
| TX2SO-L2-9 V   | 9                     | 6.75                     | 6.75                       | 22.2   | 405                                      | 200                         | 13.5                         |
| TX2SO-L2-12 V  | 12                    | 9                        | 9                          | 16.7   | 720                                      | 200                         | 18                           |
| TX2SO-L2-24 V  | 24                    | 18                       | 18                         | 8.3  | 2,880                                    | 200                         | 36                           |

○: For each surface-mounted terminal variation, input the following letter.

SA type: A, SL type: L, SS type: S

**Notes:**

- Specified value of pick-up, drop-out, set and reset voltage is with the condition of square wave coil pulse.
- Standard packing: Tube: 40 pcs.; Case: 1,000 pcs.
- Tape and reel packing is also available for surface-mount type by request. Part number suffix "-X" or "-Z" is needed when ordering. In this case, "X" or "Z" are not marked on the relay.  
Quantity in tape and reel: 500 pcs.

(ex.) • TX2SA-3V-X

└ Picked from the 1/3/4/5-pin side

• TX2SA-L-3V-Z

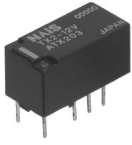
└ Picked from the 8/9/10/12-pin side

- In case of 5 V transistor drive circuit, it is recommended to use 4.5 V type relay.

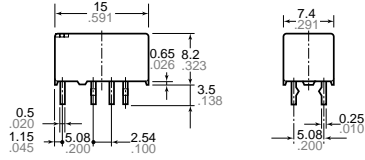
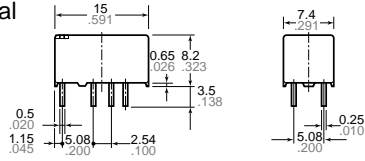
# DIMENSIONS

## 1. Single side stable and 1 coil latching type

Standard PC board terminal



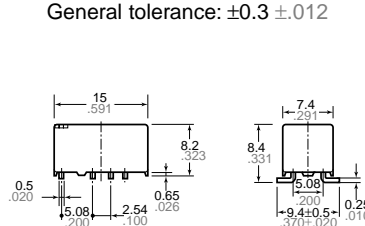
Self clinching terminal



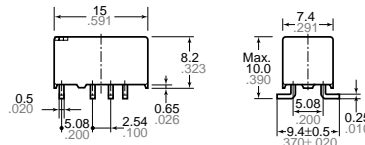
Surface-mount terminal SA type



SL type

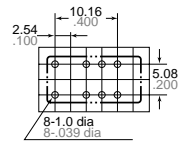


SS type



General tolerance:  $\pm 0.3 \pm .012$

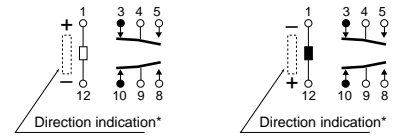
PC board pattern (Copper-side view)



Tolerance:  $\pm 0.1 \pm .004$

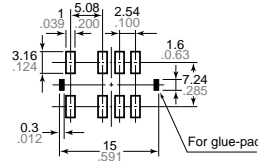
Schematic (Bottom view)

Single side stable (Deenergized condition)      1 coil latching (Reset condition)



\*Orientation stripe located on top of relay.

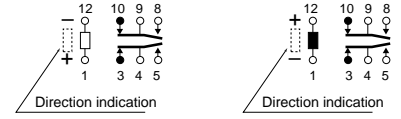
Suggested mounting pad (Top view)



Tolerance:  $\pm 0.1 \pm .004$

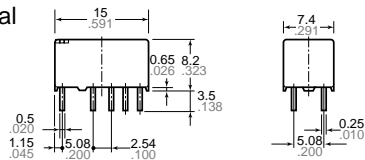
Schematic (Top view)

Single side stable (Deenergized condition)      1 coil latching (Reset condition)

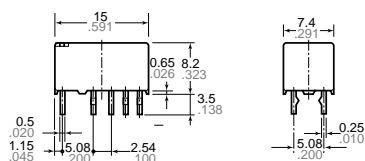


## 2. Coil latching type

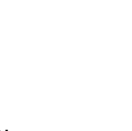
Standard PC board terminal



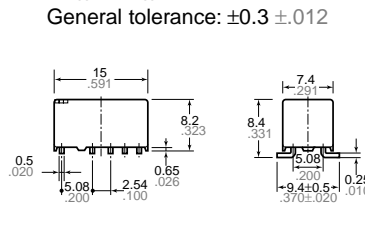
Self clinching terminal



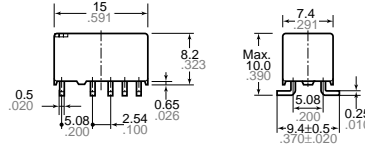
Surface-mount terminal SA type



SL type

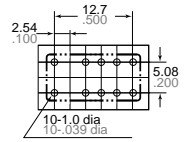


SS type



General tolerance:  $\pm 0.3 \pm .012$

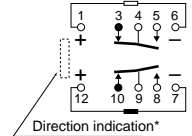
PC board pattern (Copper side view)



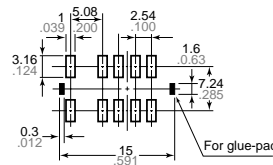
Tolerance:  $\pm 0.1 \pm .004$

Schematic (Bottom view)

2 coil latching (Reset condition)



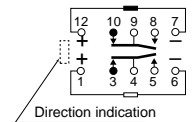
Suggested mounting pad (Top view)



Tolerance:  $\pm 0.1 \pm .004$

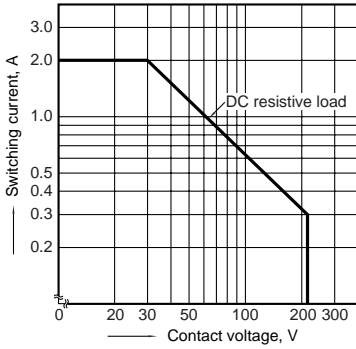
Schematic (Top view)

1 coil latching (Reset condition)

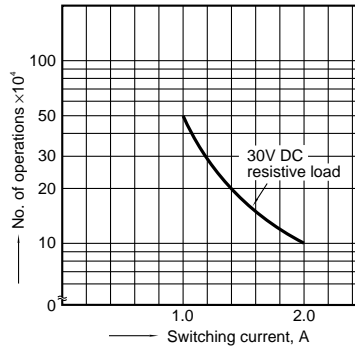


REFERENCE DATA

1. Maximum switching capacity

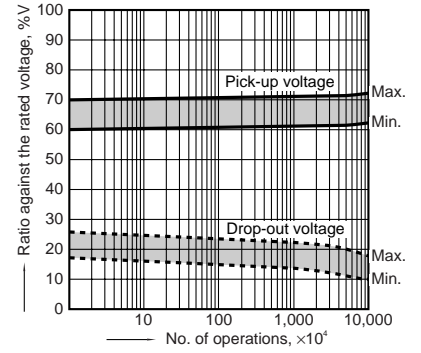


2. Life curve



3. Mechanical life

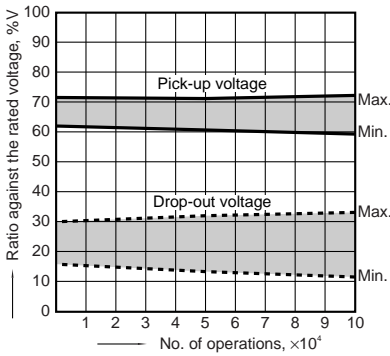
Tested sample: TX2-5V, 10 pcs.  
Operating frequency: 180 cpm



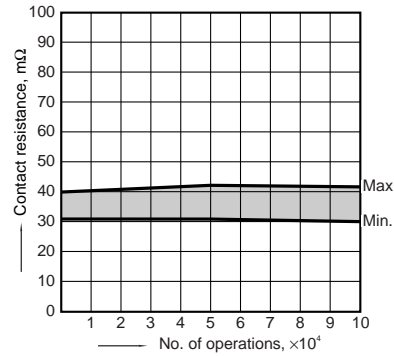
4. Electrical life

Tested sample: TX2-5V, 6 pcs.  
Operating frequency: 20 cpm

Change of pick-up and drop-out voltage

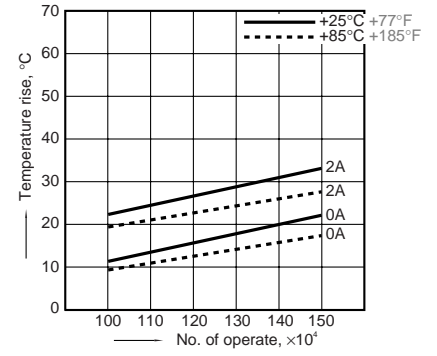


Change of contact resistance



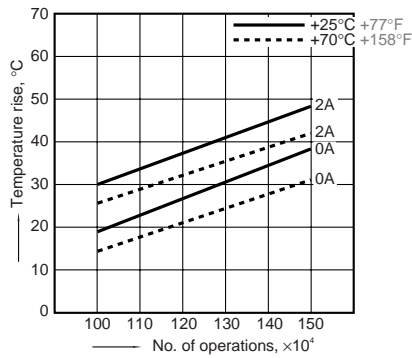
5-(1). Coil temperature rise

Tested sample: TX2-5V, 6 pcs.  
Point measured: Inside the coil  
Ambient temperature: 25°C 77°F, 85°C 185°F



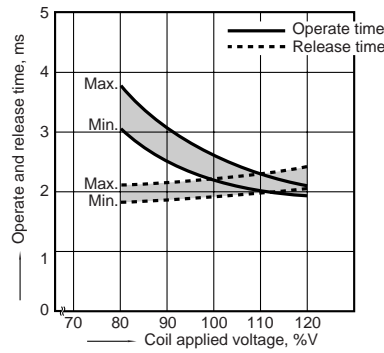
5-(2). Coil temperature rise

Tested sample: TX2-48V, 6 pcs.  
Point measured: Inside the coil  
Ambient temperature: 25°C 77°F, 70°C 158°F

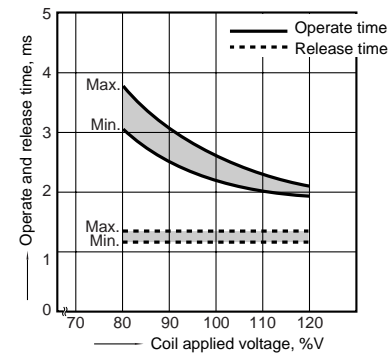


6-(1). Operate and release time (with diode)

Tested sample: TX2-5V, 10 pcs.

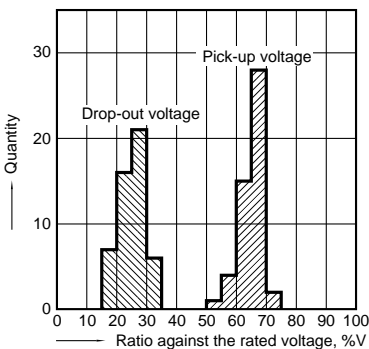


6-(2). Operate and release time (without diode)



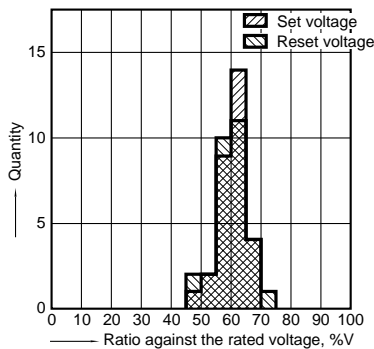
7. Distribution of pick-up and drop-out voltage

Tested sample: TX2-5V, 50 pcs.



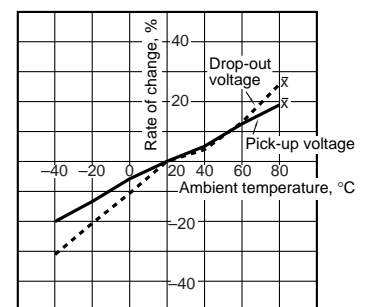
8. Distribution of set and reset voltage

Tested sample: TX2-L2-12V, 30 pcs.

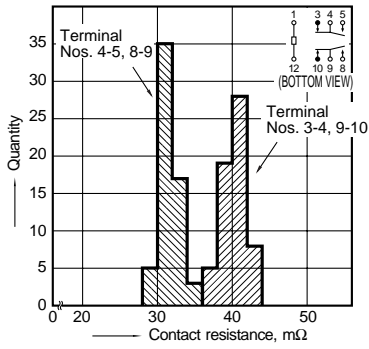


9. Ambient temperature characteristics

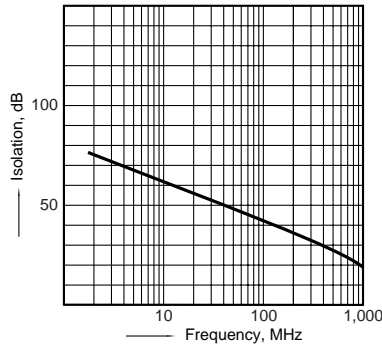
Tested sample: TX2-5V, 5 pcs.



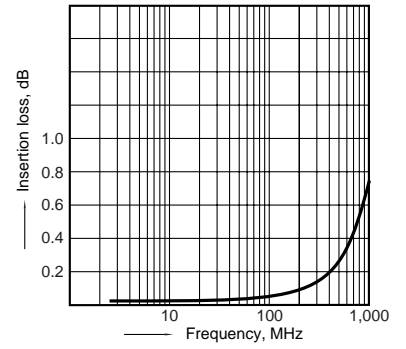
10. Distribution of contact resistance  
Tested sample: TX2-5V, 30 pcs. (30 × 4 contacts)



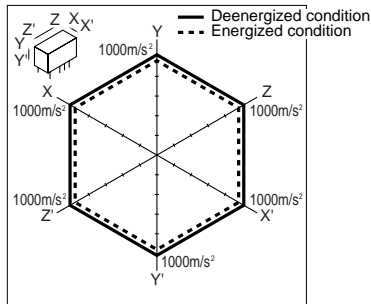
11-(1). High frequency characteristics  
Tested sample: TX2-12V, 2 pcs.  
Isolation characteristics



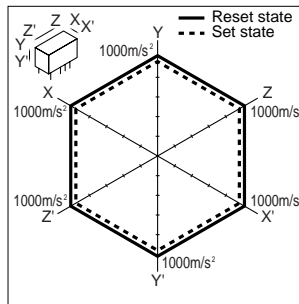
11-(2). High frequency characteristics  
Tested sample: TX2-12V, 2 pcs.  
Insertion loss characteristics



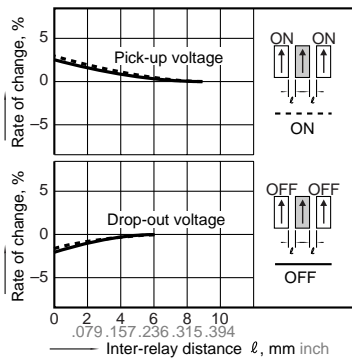
12-(1). Malfunctional shock (single side stable)  
Tested sample: TX2-5V, 6 pcs



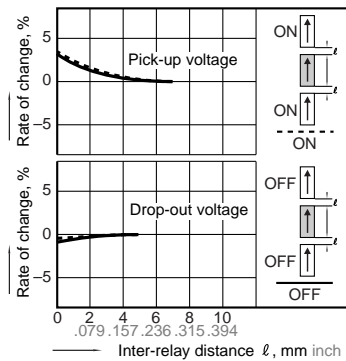
12-(2). Malfunctional shock (latching)  
Tested sample: TX2-L2-12V, 6 pcs.



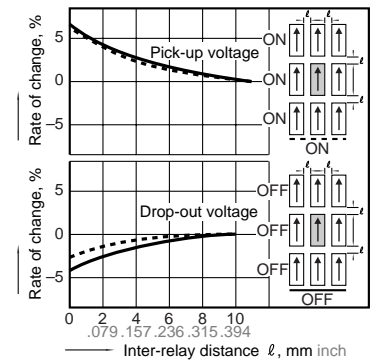
13-(1). Influence of adjacent mounting



13-(2). Influence of adjacent mounting

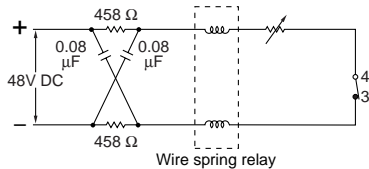


13-(3). Influence of adjacent mounting

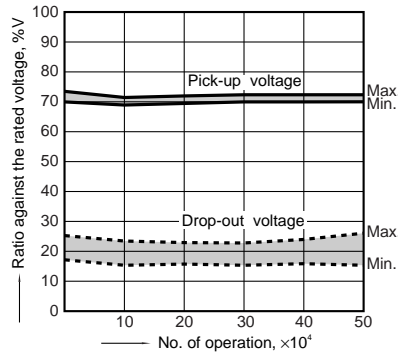


14. Pulse dialing test  
Tested sample: TX2-5V, 6 pcs.  
(35 mA 48 V DC wire spring relay load)

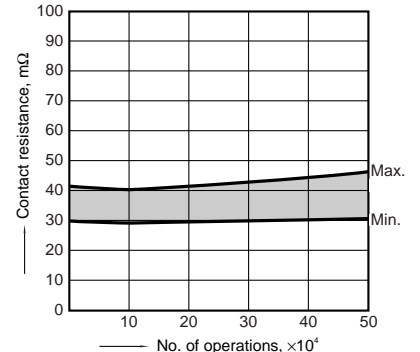
Circuit



Change of pick-up and drop-out voltage



Change of contact resistance



Note: Data of surface-mount type are the same as those of PC board terminal type.

**For Cautions for Use, see Page 178 and 179.**