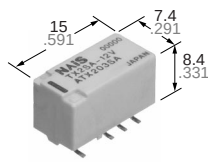
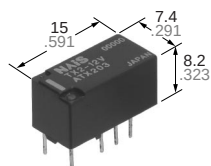


# NAIS

## 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.<br>(By voltage drop 6 V DC 1 A) | 100 mΩ                                         |                                             |
| Contact material                                                 | Gold-clad silver alloy                         |                                             |
| Rating                                                           | Nominal switching capacity<br>(resistive load) | 2 A 30 V DC                                 |
|                                                                  | Max. switching power<br>(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<br>operating<br>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<br>life (min.<br>operations)                            | Mechanical (at 180 cpm)                        | 10 <sup>8</sup>                             |
|                                                                  | Electrical<br>(at 20 cpm)                      | 2 A 30 V DC<br>resistive                    |
|                                                                  |                                                | 1 A 30 V DC<br>resistive                    |

### 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<br>breakdown<br>voltage                                                                                     | Between open con-<br>tacts              | 1,000 Vrms for 1 min.<br>(Detection current: 10 mA)                                                                                |
|                                                                                                                     | Between contact sets                    | 1,000 Vrms for 1 min.<br>(Detection current: 10 mA)                                                                                |
|                                                                                                                     | Between contact and<br>coil             | 2,000 Vrms for 1 min.<br>(Detection current: 10 mA)                                                                                |
| Initial surge<br>voltage                                                                                            | Between open<br>contacts<br>(10×160 μs) | 1,500 V (FCC Part 68)                                                                                                              |
|                                                                                                                     | Between contacts<br>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<br>at double amplitude of 3.3 mm                                                          |
|                                                                                                                     | Destructive                             | 294 m/s <sup>2</sup> {30G}, 10 to 55 Hz<br>at double amplitude of 5 mm                                                             |
| Conditions for oper-<br>ation, transport and<br>storage*8<br>(Not freezing and<br>condensing at low<br>temperature) | Ambient tem-<br>perature ※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                                                                                                                |

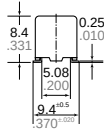
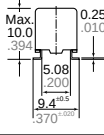
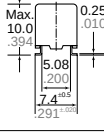
## ORDERING INFORMATION

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.

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 |
|-------------|-----------------------|------------------------------|-------------------------------|----------------------------------------------|------------------------------------------|-----------------------------|------------------------------|
| TX2S○-1.5 V | 1.5                   | 1.13                         | 0.15                          | 93.8                                         | 16                                       | 140                         | 2.2                          |
| TX2S○-3 V   | 3                     | 2.25                         | 0.3                           | 46.7                                         | 64.3                                     | 140                         | 4.5                          |
| TX2S○-4.5 V | 4.5                   | 3.38                         | 0.45                          | 31                                           | 145                                      | 140                         | 6.7                          |
| TX2S○-5 V   | 5                     | 3.75                         | 0.5                           | 28.1                                         | 178                                      | 140                         | 7.5                          |
| TX2S○-6 V   | 6                     | 4.5                          | 0.6                           | 23.3                                         | 257                                      | 140                         | 9                            |
| TX2S○-9 V   | 9                     | 6.75                         | 0.9                           | 15.5                                         | 579                                      | 140                         | 13.5                         |
| TX2S○-12 V  | 12                    | 9                            | 1.2                           | 11.7                                         | 1,028                                    | 140                         | 18                           |
| TX2S○-24 V  | 24                    | 18                           | 2.4                           | 5.8                                          | 4,114                                    | 140                         | 36                           |
| TX2S○-48 V  | 48                    | 36                           | 4.8                           | 5.6                                          | 8,533                                    | 270                         | 57.6                         |

| 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 |
|---------------|-----------------------|--------------------------|----------------------------|--------------------------------------|---------------------------|-----------------------------|------------------------------|
| TX2S○-L-1.5 V | 1.5                   | 1.13                     | 1.13                       | 66.7                                 | 22.5                      | 100                         | 2.2                          |
| TX2S○-L-3 V   | 3                     | 2.25                     | 2.25                       | 33.3                                 | 90                        | 100                         | 4.5                          |
| TX2S○-L-4.5 V | 4.5                   | 3.38                     | 3.38                       | 22.2                                 | 202.5                     | 100                         | 6.7                          |
| TX2S○-L-5 V   | 5                     | 3.75                     | 3.75                       | 20                                   | 250                       | 100                         | 7.5                          |
| TX2S○-L-6 V   | 6                     | 4.5                      | 4.5                        | 16.7                                 | 360                       | 100                         | 9                            |
| TX2S○-L-9 V   | 9                     | 6.75                     | 6.75                       | 11.1                                 | 810                       | 100                         | 13.5                         |
| TX2S○-L-12 V  | 12                    | 9                        | 9                          | 8.3                                  | 1,440                     | 100                         | 18                           |
| TX2S○-L-24 V  | 24                    | 18                       | 18                         | 4.2                                  | 5,760                     | 100                         | 36                           |

| Part No.       | Nominal voltage,<br>V DC | Set voltage,<br>V DC (max.) | Reset voltage,<br>V DC (max.) | Nominal operating current,<br>mA (±10%) | Coil resistance,<br>Ω (±10%) | Nominal operating power,<br>mW | Max. allowable voltage,<br>V DC |
|----------------|--------------------------|-----------------------------|-------------------------------|-----------------------------------------|------------------------------|--------------------------------|---------------------------------|
| TX2S○-L2-1.5 V | 1.5                      | 1.13                        | 1.13                          | 133.9                                   | 11.2                         | 200                            | 2.2                             |
| TX2S○-L2-3 V   | 3                        | 2.25                        | 2.25                          | 66.7                                    | 45                           | 200                            | 4.5                             |
| TX2S○-L2-4.5 V | 4.5                      | 3.38                        | 3.38                          | 44.5                                    | 101.2                        | 200                            | 6.7                             |
| TX2S○-L2-5 V   | 5                        | 3.75                        | 3.75                          | 40                                      | 125                          | 200                            | 7.5                             |
| TX2S○-L2-6 V   | 6                        | 4.5                         | 4.5                           | 33.3                                    | 180                          | 200                            | 9                               |
| TX2S○-L2-9 V   | 9                        | 6.75                        | 6.75                          | 22.2                                    | 405                          | 200                            | 13.5                            |
| TX2S○-L2-12 V  | 12                       | 9                           | 9                             | 16.7                                    | 720                          | 200                            | 18                              |
| TX2S○-L2-24 V  | 24                       | 18                          | 18                            | 8.3                                     | 2,880                        | 200                            | 36                              |

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

**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. 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 • TX2SA-L-3V-Z

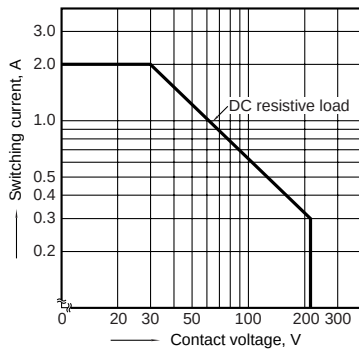
└ Picked from the 1/3/4/5-pin side └ Picked from the 8/9/10/12-pin side

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

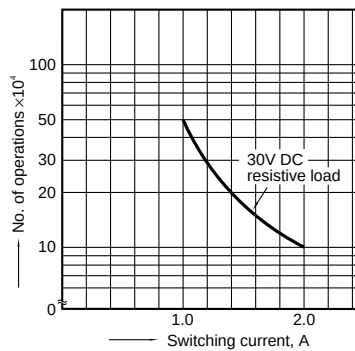


## REFERENCE DATA

## 1. Maximum switching capacity



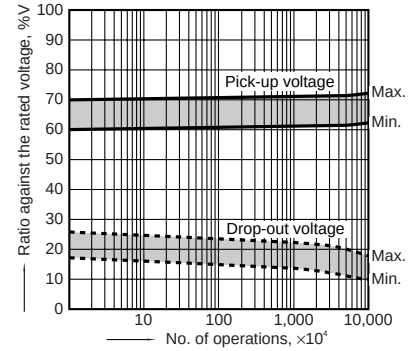
## 2. Life curve



## 3. Mechanical life

Tested sample: TX2-5V, 10 pcs.

Operating frequency: 180 cpm

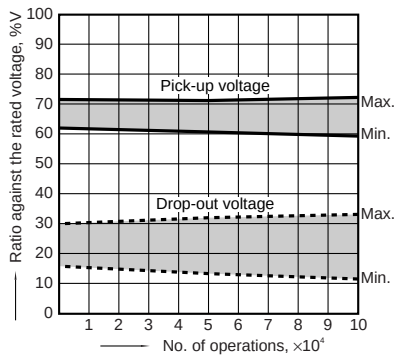


## 4. Electrical life

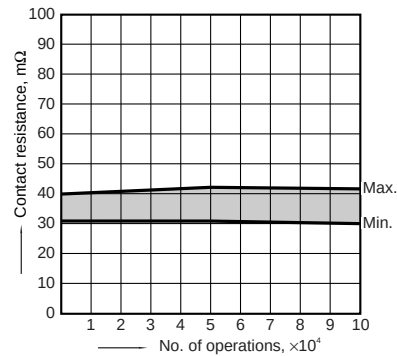
Tested sample: TX2-5V, 6 pcs.

Operating frequency: 20 cpm

## Change of pick-up and drop-out voltage



## Change of contact resistance

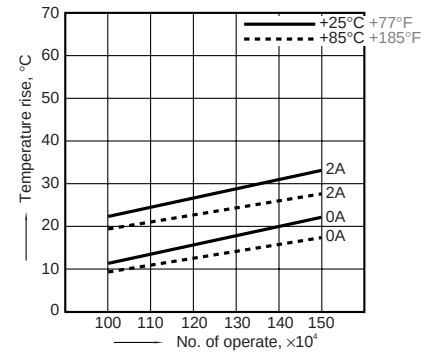


## 5-(1). Coil temperature rise

Tested sample: TX2-5V, 6 pcs.

Point measured: Inside the coil

Ambient temperature: 25°C 77°F, 85°C 185°F

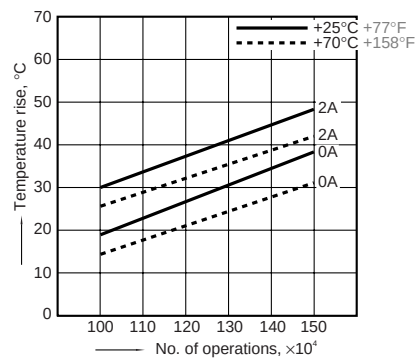


## 5-(2). Coil temperature rise

Tested sample: TX2-48V, 6 pcs.

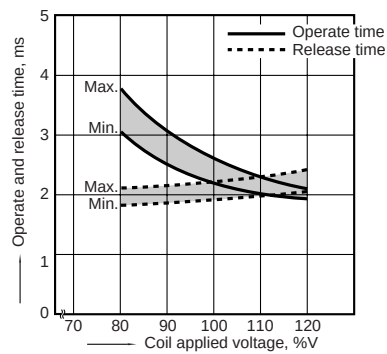
Point measured: Inside the coil

Ambient temperature: 25°C 77°F, 70°C 158°F

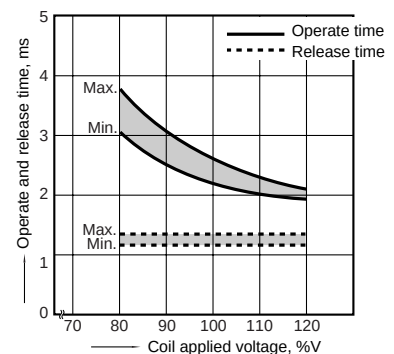


## 6-(1). Operate and release time (with diode)

Tested sample: TX2-5V, 10 pcs.

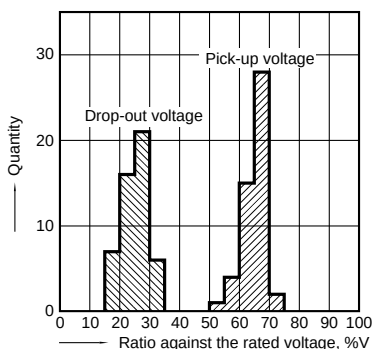


## 6-(2). Operate and release time (without diode)



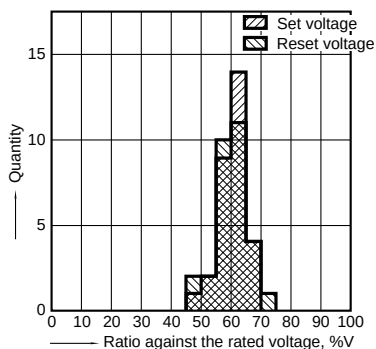
## 7. Distribution of pick-up and drop-out voltage

Tested sample: TX2-5V, 50 pcs.



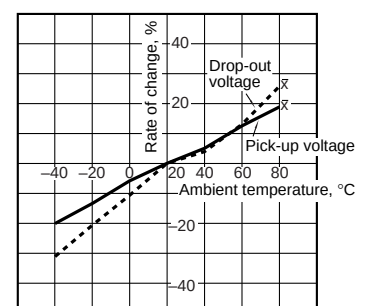
## 8. Distribution of set and reset voltage

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



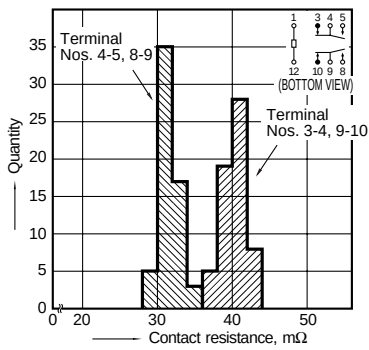
## 9. Ambient temperature characteristics

Tested sample: TX2-5V, 5 pcs.



## 10. Distribution of contact resistance

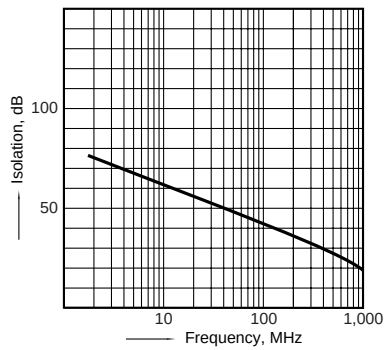
Tested sample: TX2-5V, 30 pcs. (30 × 4 contacts)



## 11-(1). High frequency characteristics

Tested sample: TX2-12V, 2 pcs.

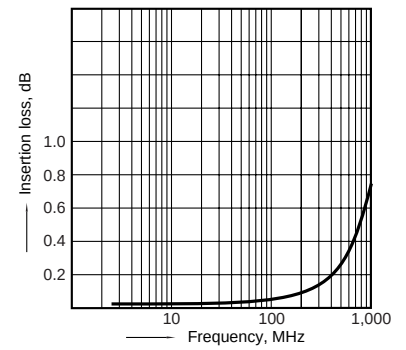
Isolation characteristics



## 11-(2). High frequency characteristics

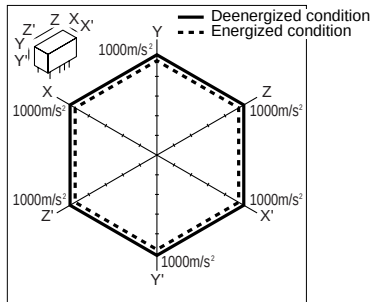
Tested sample: TX2-12V, 2 pcs.

Insertion loss characteristics



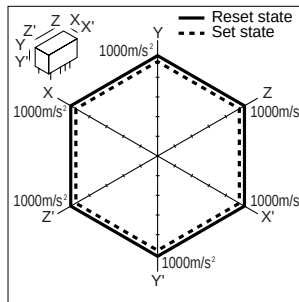
## 12-(1). Malfunctional shock (single side stable)

Tested sample: TX2-5V, 6 pcs

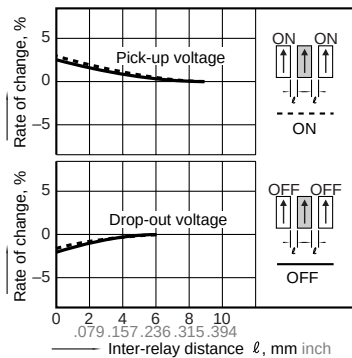


## 12-(2). Malfunctional shock (latching)

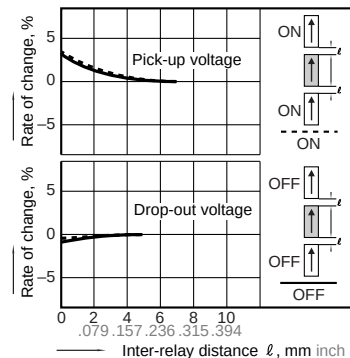
Tested sample: TX2-L2-12V, 6 pcs.



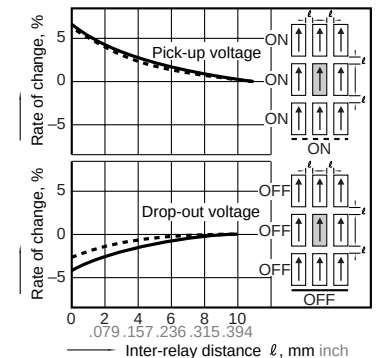
## 13-(1). Influence of adjacent mounting



## 13-(2). Influence of adjacent mounting



## 13-(3). Influence of adjacent mounting

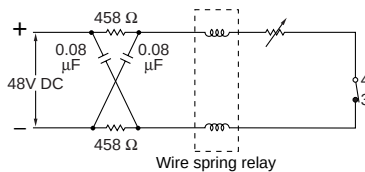


## 14. Pulse dialing test

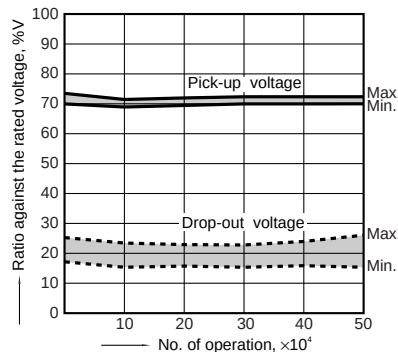
Tested sample: TX2-5V, 6 pcs.

(35 mA 48 V DC wire spring relay load)

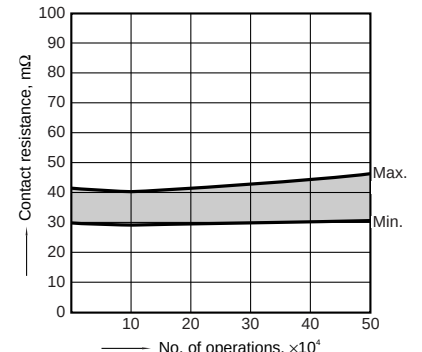
Circuit



## 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.**