



**Panasonic**  
ideas for life

**ULTRA LOW PROFILE 2 A  
POLARIZED RELAY**

**TK RELAYS**



**RoHS Directive compatibility information**  
<http://www.mew.co.jp/ac/e/environment/>

## FEATURES

### 1. Compact and flat type

10.6(L) × 9.0(W) × 4.0(H) .417(L) × .354(W) × .157(H)

### 2. High contact capacity: 2 A

### 3. Outstanding surge resistance.

Surge breakdown voltage between contact and coil:

2,500 V 2 × 10 μsec. (Telcordia)

Surge breakdown voltage between open contacts:

1,500 V 10 × 160 μsec. (FCC part 68)

### 4. Initial breakdown voltage:

1,500 Vrms for 1 min. (Between contact and coil)

### 5. Nominal operating power:

High sensitivity of 140mW (Single side stable type)

By using the highly efficient polar magnetic circuit "seesaw balance mechanism", a nominal operating power of 140 mW (minimum operating power of 79 mW) has been achieved.

### 6. Outstanding vibration and shock resistance.

Functional shock resistance: 750 m/s<sup>2</sup>

Destructive shock resistance: 1,000 m/s<sup>2</sup>

Functional vibration resistance:

10 to 55 Hz (at double amplitude of 3.3 mm .130 inch)

Destructive vibration resistance:

10 to 55 Hz (at double amplitude of 5 mm .197 inch)

### 7. The use of gold-clad twin crossbar contacts ensures high contact reliability.

\*We also offer a range of products with AgPd contacts suitable for use in low level load analog circuits (Max. 10V DC 10 mA).

\*SX relays designed for low level loads are also available.

### 8. Self-clinching terminal also available

### 9. Pre-soldering terminal

### 10. Sealed construction allows automatic washing.

## TYPICAL APPLICATIONS

### 1. Computer peripherals

### 2. Telephone devices and telecommunications equipment

### 3. Crime and disaster prevention equipment

### 4. Machine tools

## ORDERING INFORMATION

TK 1 - - -

Contact arrangement

1: 1 Form C

Operating function

Nil: Single side stable

L: 1 coil latching

L2: 2 coil latching

Terminal shape

Nil: Standard PC board terminal

H: Self-clinching terminal

Coil voltage (DC)

1.5, 3, 4.5, 5, 6, 9, 12, 24V

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

TK

## TYPES

## 1) Standard PC board terminal

| Contact arrangement | Nominal coil voltage | Single side stable | 1 coil latching | 2 coil latching |
|---------------------|----------------------|--------------------|-----------------|-----------------|
|                     |                      | Part No.           | Part No.        | Part No.        |
| 1 Form C            | 1.5V DC              | TK1-1.5V           | TK1-L-1.5V      | TK1-L2-1.5V     |
|                     | 3V DC                | TK1-3V             | TK1-L-3V        | TK1-L2-3V       |
|                     | 4.5V DC              | TK1-4.5V           | TK1-L-4.5V      | TK1-L2-4.5V     |
|                     | 5V DC                | TK1-5V             | TK1-L-5V        | TK1-L2-5V       |
|                     | 6V DC                | TK1-6V             | TK1-L-6V        | TK1-L2-6V       |
|                     | 9V DC                | TK1-9V             | TK1-L-9V        | TK1-L2-9V       |
|                     | 12V DC               | TK1-12V            | TK1-L-12V       | TK1-L2-12V      |
|                     | 24V DC               | TK1-24V            | TK1-L-24V       | TK1-L2-24V      |

Standard packing: Tube: 50 pcs.; Case: 1,000 pcs.

## 2) Self-clinching terminal

| Contact arrangement | Nominal coil voltage | Single side stable | 1 coil latching | 2 coil latching |
|---------------------|----------------------|--------------------|-----------------|-----------------|
|                     |                      | Part No.           | Part No.        | Part No.        |
| 1 Form C            | 1.5V DC              | TK1-H-1.5V         | TK1-L-H-1.5V    | TK1-L2-H-1.5V   |
|                     | 3V DC                | TK1-H-3V           | TK1-L-H-3V      | TK1-L2-H-3V     |
|                     | 4.5V DC              | TK1-H-4.5V         | TK1-L-H-4.5V    | TK1-L2-H-4.5V   |
|                     | 5V DC                | TK1-H-5V           | TK1-L-H-5V      | TK1-L2-H-5V     |
|                     | 6V DC                | TK1-H-6V           | TK1-L-H-6V      | TK1-L2-H-6V     |
|                     | 9V DC                | TK1-H-9V           | TK1-L-H-9V      | TK1-L2-H-9V     |
|                     | 12V DC               | TK1-H-12V          | TK1-L-H-12V     | TK1-L2-H-12V    |
|                     | 24V DC               | TK1-H-24V          | TK1-L-H-24V     | TK1-L2-H-24V    |

Standard packing: Tube: 50 pcs.; Case: 1,000 pcs.

## RATING

## 1. Coil data

## 1) Single side stable

| Nominal coil voltage | Pick-up voltage (at 20°C 68°F)             | Drop-out voltage (at 20°C 68°F)            | Nominal operating current [±10%] (at 20°C 68°F) | Coil resistance [±10%] (at 20°C 68°F) | Nominal operating power | Max. allowable voltage (at 20°C 68°F) |
|----------------------|--|--|---|---------------------------------------|-------------------------|---------------------------------------|
| 1.5V DC              | 75%V or less of nominal voltage* (Initial) | 10%V or more of nominal voltage* (Initial) | 93.8mA  | 16Ω                                   | 140mW                   | 150%V of nominal voltage              |
| 3V DC                |  |  | 46.7mA  | 64.3Ω                                 |                         |                                       |
| 4.5V DC              |  |  | 31mA  | 145Ω                                  |                         |                                       |
| 5V DC                |  |  | 28.1mA  | 178Ω                                  |                         |                                       |
| 6V DC                |  |  | 23.3mA  | 257Ω                                  |                         |                                       |
| 9V DC                |  |  | 15.5mA  | 579Ω                                  |                         |                                       |
| 12V DC               |  |  | 11.7mA  | 1,028Ω                                |                         |                                       |
| 24V DC               |  |  | 11.3mA  | 2,133Ω                                | 270mW                   | 120%V of nominal voltage              |

## 2) 1 coil latching

| Nominal coil voltage | Set voltage (at 20°C 68°F)                 | Reset voltage (at 20°C 68°F)               | Nominal operating current [±10%] (at 20°C 68°F) | Coil resistance [±10%] (at 20°C 68°F) | Nominal operating power | Max. allowable voltage (at 20°C 68°F) |
|----------------------|--|--|---|---------------------------------------|-------------------------|---------------------------------------|
| 1.5V DC              | 75%V or less of nominal voltage* (Initial) | 75%V or less of nominal voltage* (Initial) | 66.7mA  | 22.5Ω                                 | 100mW                   | 150%V of nominal voltage              |
| 3V DC                |  |  | 33.3mA  | 90Ω                                   |                         |                                       |
| 4.5V DC              |  |  | 22.2mA  | 202.5Ω                                |                         |                                       |
| 5V DC                |  |  | 20mA  | 250Ω                                  |                         |                                       |
| 6V DC                |  |  | 16.7mA  | 360Ω                                  |                         |                                       |
| 9V DC                |  |  | 11.1mA  | 810Ω                                  |                         |                                       |
| 12V DC               |  |  | 8.3mA   | 1,440Ω                                |                         |                                       |
| 24V DC               |  |  | 6.3mA   | 3,840Ω                                | 150mW                   | 120%V of nominal voltage              |

\*Pulse drive (JIS C 5442-1986)

## 3) 2 coil latching

| Nominal coil voltage | Set voltage (at 20°C 68°F)                 | Reset voltage (at 20°C 68°F)               | Nominal operating current [±10%] (at 20°C 68°F) |            | Coil resistance [±10%] (at 20°C 68°F) |            | Nominal operating power  |            | Max. allowable voltage (at 20°C 68°F) |
|----------------------|--|--|---|------------|---------------------------------------|------------|--------------------------|------------|---------------------------------------|
|                      |  |  | Set coil  | Reset coil | Set coil                              | Reset coil | Set coil                 | Reset coil |                                       |
| 1.5V DC              | 75%V or less of nominal voltage* (Initial) | 75%V or less of nominal voltage* (Initial) | 133.9mA   | 133.9mA    | 11.2Ω                                 | 11.2Ω      | 200mW                    | 200mW      | 150%V of nominal voltage              |
| 3V DC                |  |  | 66.7mA  | 66.7mA     | 45Ω                                   | 45Ω        |                          |            |                                       |
| 4.5V DC              |  |  | 44.5mA  | 44.5mA     | 101.2Ω                                | 101.2Ω     |                          |            |                                       |
| 5V DC                |  |  | 40mA  | 40mA       | 125Ω                                  | 125Ω       |                          |            |                                       |
| 6V DC                |  |  | 33.3mA  | 33.3mA     | 180Ω                                  | 180Ω       |                          |            |                                       |
| 9V DC                |  |  | 22.2mA  | 22.2mA     | 405Ω                                  | 405Ω       |                          |            |                                       |
| 12V DC               |  |  | 20.8mA  | 20.8mA     | 576Ω                                  | 576Ω       | 250mW                    | 250mW      | 120%V of nominal voltage              |
| 24V DC               | 16.7mA                                     | 16.7mA                                     | 1,440Ω  | 1,440Ω     | 400mW                                 | 400mW      | 110%V of nominal voltage |            |                                       |

\*Pulse drive (JIS C 5442-1986)

## 2. Specifications

| Characteristics                          | Item   | Specifications   |  |
|--|--|--|--|
| Contact                                  | Arrangement  | 1 Form C   |  |
|  | Initial contact resistance, max.   | Max. 50 mΩ (By voltage drop 6 V DC 1A)   |  |
|  | Contact material   | Ag+Au clad   |  |
| Rating                                   | Nominal switching capacity (resistive load)  | 2 A 30 V DC  |  |
|  | Max. switching power (resistive load)  | 60 W (DC)  |  |
|  | Max. switching voltage   | 220 V DC   |  |
|  | Max. switching current   | 2 A  |  |
|  | Min. switching capacity (Reference value)*1  | 10μA 10mV DC   |  |
|  | Nominal operating power  | Single side stable<br>1 coil latching<br>2 coil latching   | 140 mW (1.5 to 12 V DC), 270 mW (24 V DC)<br>100 mW (1.5 to 12 V DC), 150 mW (24 V DC)<br>200 mW (1.5 to 9 V DC), 250 mW (12 V DC), 400 mW (24 V DC) |
| Electrical characteristics               | Insulation resistance (Initial)  | Min. 1,000MΩ (at 500V DC)<br>Measurement at same location as "Initial breakdown voltage" section.                                |  |
|  | Breakdown voltage (Initial)  | Between open contacts  | 750 Vrms for 1 min. (Detection current: 10 mA)   |
|  |  | Between contact and coil   | 1,500 Vrms for 1 min. (Detection current: 10 mA)   |
|  | Surge breakdown voltage (Initial)  | Between open contacts  | 1,500 V (10×160μs) (FCC Part 68)   |
|  |  | Between contacts and coil  | 2,500 V (2×10μs) (Telcordia)   |
|  | Temperature rise (at 20°C 68°F)  | Max. 50°C<br>(By resistive method, nominal voltage applied to the coil; contact carrying current: 2A.)                           |  |
| Operate time [Set time] (at 20°C 68°F)   | Max. 3 ms [Max. 3 ms] (Nominal voltage applied to the coil, excluding contact bounce time.)                    |  |  |
| Release time [Reset time] (at 20°C 68°F) | Max. 2 ms [Max. 3 ms] (Nominal voltage applied to the coil, excluding contact bounce time.)<br>(without diode) |  |  |
| Mechanical characteristics               | Shock resistance   | Functional   | Min. 750 m/s <sup>2</sup> (Half-wave pulse of sine wave: 6 ms; detection time: 10μs.)  |
|  |  | Destructive  | Min. 1,000 m/s <sup>2</sup> (Half-wave pulse of sine wave: 6 ms.)  |
|  | Vibration resistance   | Functional   | 10 to 55 Hz at double amplitude of 3.3 mm (Detection time: 10μs.)  |
|  |  | Destructive  | 10 to 55 Hz at double amplitude of 5 mm  |
| Expected life                            | Mechanical   | Min. 10 <sup>8</sup> (Single side stable), Min. 5×10 <sup>7</sup> (1 or 2 coil latching) (at 180 cpm)                            |  |
|  | Electrical   | Min. 10 <sup>5</sup> (2 A 30 V DC resistive) (at 20 cpm)   |  |
| Conditions                               | Conditions for operation, transport and storage*2  | Ambient temperature: -40°C to 85°C -40°F to 185°F*3;<br>Humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature) |  |
|  | Max. operating speed (at rated load)   | 20 cpm   |  |
| Unit weight                              |  | Approx. 1 g .035 oz.   |  |

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. (SX relays are available for low level load switching [10V DC, 10mA max. level])

\*2 Refer to 6. Conditions for operation, transport and storage mentioned in AMBIENT ENVIRONMENT.

\*3 The maximum ambient temperature allows for coil temperature rise at maximum allowable coil voltage.

As for the applicable range of continuous carrying current against temperature, please refer to "Maximum value of continuous carrying current" chart.

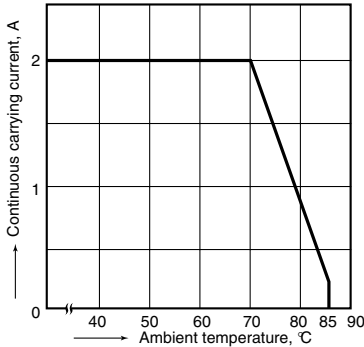
## REFERENCE DATA

### 1. Maximum value of continuous carrying current

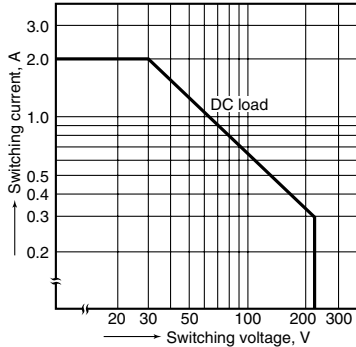
Test conditions:

Coil applied voltage: 110% of rated voltage

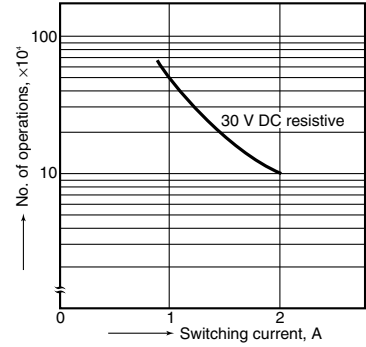
Continuous carrying current: 1,000 hours



### 2. Maximum switching capacity



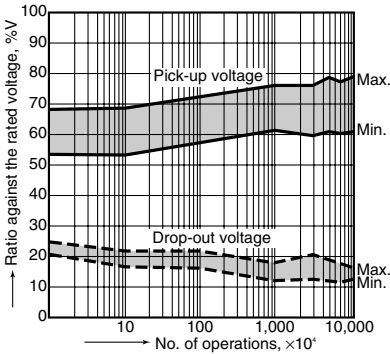
### 3. Life curve



### 4. Mechanical life

Tested sample: TK1-12V, 8 pcs.

Switching frequency: 30 Hz

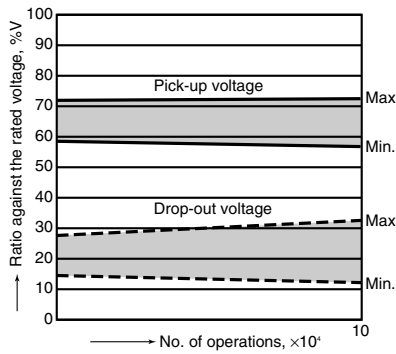


### 5. Electrical life (DC load)

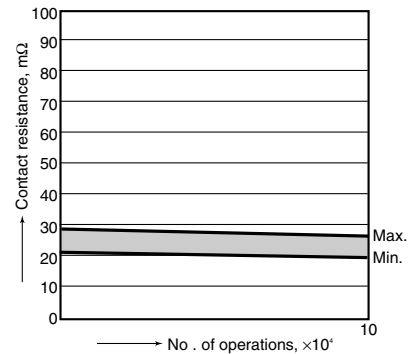
Tested sample: TK1-12V, 10 pcs.

Condition: 2 A 30 V DC resistive load, 20 cpm

Change of pick-up and drop-out voltage



Change of contact resistance

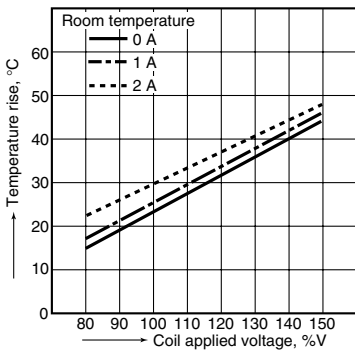


### 6.-(1) Coil temperature rise

Tested sample: TK1-12V, 6 pcs.

Measured portion: Inside the coil

Ambient temperature: 25°C 77°F

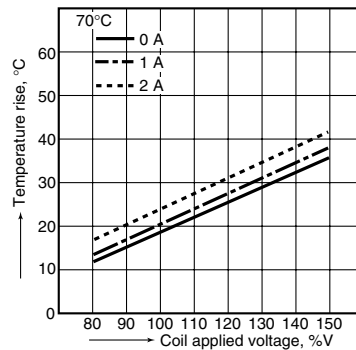


### 6.-(2) Coil temperature rise

Tested sample: TK1-12V, 6 pcs.

Measured portion: Inside the coil

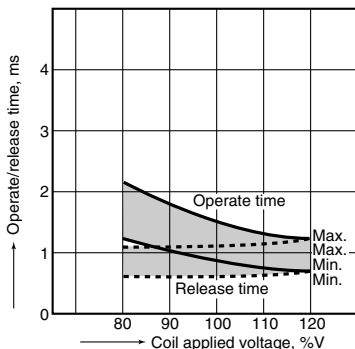
Ambient temperature: 70°C 158°F



### 7.-(1) Operate/release time characteristics

Tested sample: TK1-5 V, 50 pcs.

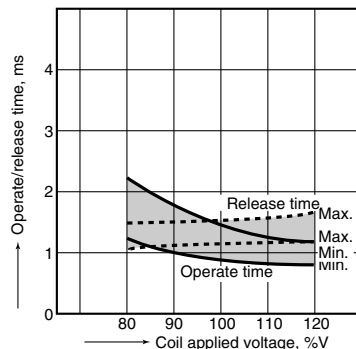
<Without diode>



### 7.-(2) Operate/release time characteristics

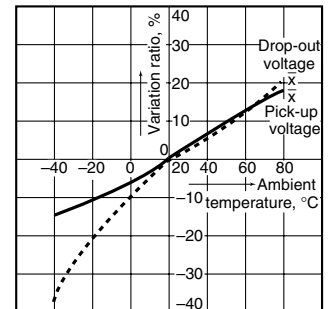
Tested sample: TK1-5 V, 50 pcs.

<With diode>

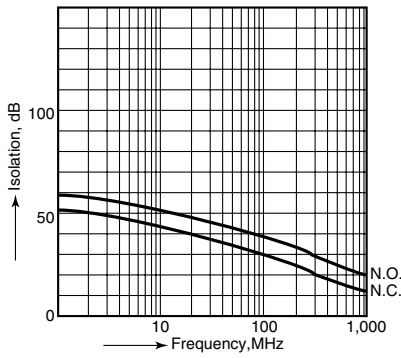


### 8. Ambient temperature characteristics

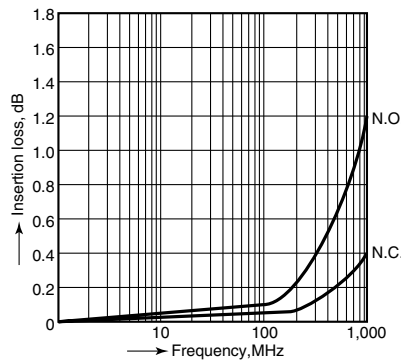
Tested sample: TK1-12V, 5 pcs.



9.-(1) High-frequency characteristics (Isolation)

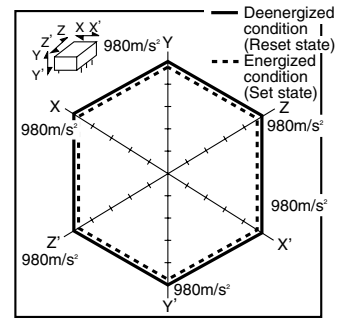


9.-(2) High-frequency characteristics (Insertion loss)

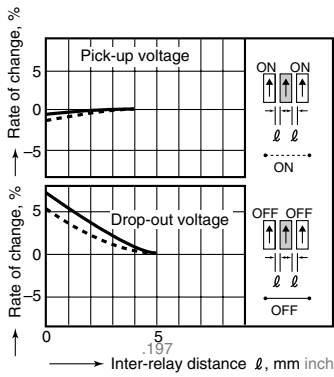


10. Malfunctional shock

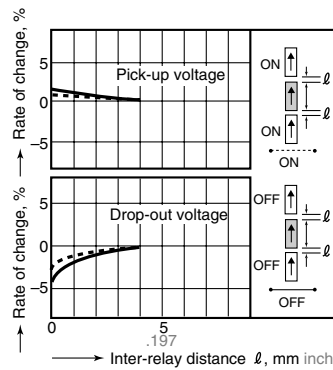
Tested sample: TK1-12V, 6 pcs. (single side stable); TK1-L2-12V, 6 pcs. (latching)



11.-(1) Influence of adjacent mounting

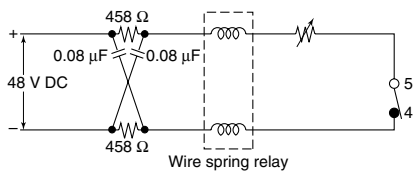


11.-(2) Influence of adjacent mounting

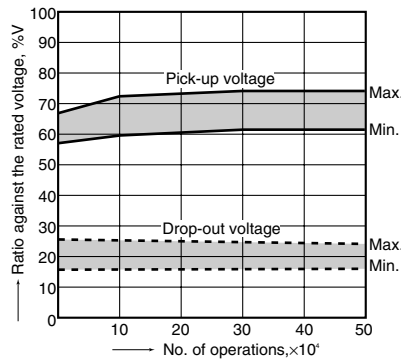


12. Actual load test (35 mA 48 V DC wire spring relay load)

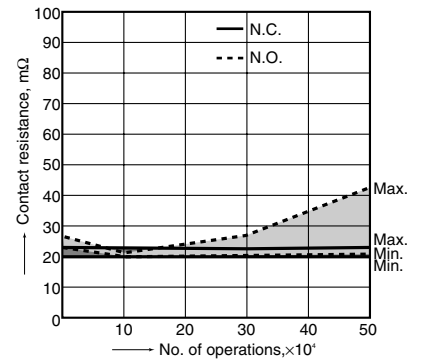
Circuit



Change of pick-up and drop-out voltage



Change of contact resistance

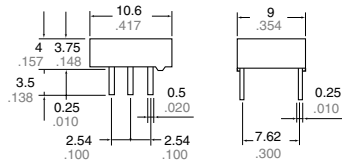


TK

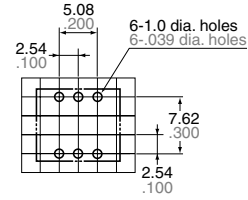
**DIMENSIONS** (Unit: mm inch)



External dimensions  
Standard PC board terminal

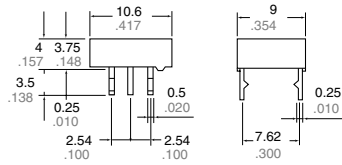


PC board pattern (Bottom view)



Tolerance:  $\pm 0.1 \pm .004$

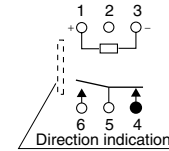
Self-clinching terminal



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

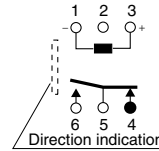
Schematic (Bottom view)

Single side stable



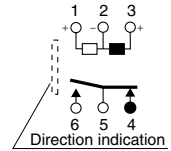
(Deenergized condition)

1-coil latching



(Reset condition)

2-coil latching



(Reset condition)

**NOTES**

**1. Coil operating power**

Pure DC current should be applied to the coil. The wave form should be rectangular. If it includes ripple, the ripple factor should be less than 5%. However, check it with the actual circuit since the characteristics may be slightly different. The nominal operating voltage should be applied to the coil for more than 10 ms to set/reset the latching type relay.

**2. Coil connection**

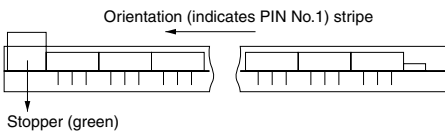
When connecting coils, refer to the wiring diagram to prevent mis-operation or malfunction.

**3. External magnetic field**

Since T series relays are highly sensitive polarized relays, their characteristics will be affected by a strong external magnetic field. Avoid using the relay under that condition.

**4. Packing style**

The relay is packed in a tube with the relay orientation mark on the left side, as shown in the figure below.



**5. Automatic insertion**

To maintain the internal function of the relay, the chucking pressure should not exceed the values below.

Chucking pressure in the direction A:

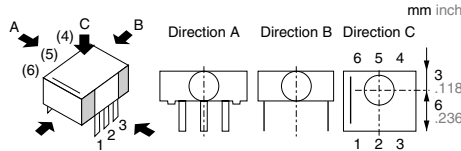
9.8 N {1 kgf} or less

Chucking pressure in the direction B:

29.4 N {3 kgf} or less

Chucking pressure in the direction C:

9.8 N {1 kgf} or less



Please chuck the portion. Avoid chucking the center of the relay. In addition, excessive chucking pressure to the pinpoint of the relay should be avoided.

**6. Soldering**

Preheat according to the following conditions.

|             |                     |
|-------------|---------------------|
| Temperature | 120°C 248°F or less |
| Time        | Within 120 sec      |

Soldering should be done at 260 $\pm$ 5°C 500 $\pm$ 41°F within 6 sec.

**For Cautions for Use, see Relay Technical Information.**