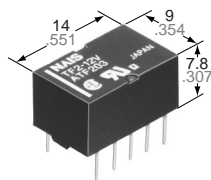


# Nais

## SMALL POLARIZED RELAY WITH HIGH SENSITIVITY

# TF-RELAYS



mm inch

### FEATURES

- **High sensitivity:**  
80 mW Nominal operating power (Single side stable 3-12 V type)
- **Surge voltage withstand: 1500 V FCC Part 68**

- **Minimal magnetic interference allows high density mounting**
- **Sealed construction allows automatic cleaning**
- **Self-clinching terminal also available**

### SPECIFICATIONS

#### Contact

|   |   |  |
|---|---|--|
| Arrangement   | 2 Form C                                    |  |
| Initial contact resistance, max. (By voltage drop 6 V DC 1 A) | 50 mΩ                                       |  |
| Contact material  | Gold-clad silver                            |  |
| Rating  | Nominal switching capacity (resistive load) | 1 A 30 V DC, 0.5 A 125 V AC                                  |
|   | Max. switching power (resistive load)       | 30 W, 62.5 VA  |
|   | Max. switching voltage                      | 110 V DC, 125 V AC   |
|   | Max. switching current                      | 1 A  |
|   | Min. switching capacity ※1                  | 10 μA 10 mV DC   |
| Nominal operating power                                       | Single side stable                          | 80 mW (3 to 12 V DC)<br>140 mW (24 V DC)<br>260 mW (48 V DC) |
|   | 1 coil latching                             | 55 mW (3 to 12 V DC)<br>100 mW (24 V DC)                     |
|   | 2 coil latching                             | 110 mW (3 to 12 V DC)<br>200 mW (24 V DC)                    |
| Expected life (min. operations)                               | Mechanical (at 180 cpm)                     | 10 <sup>8</sup>  |
|   | Electrical (at 20 cpm)                      | 1 A 30 V DC resistive load<br>2×10 <sup>5</sup>              |
|   |   | 0.5 A 125 V AC resistive load<br>10 <sup>5</sup>             |

#### Note:

※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.

#### Characteristics

|  |                          |   |
|--|--------------------------|---|
| Initial insulation resistance*1  |                          | Min. 1,000 MΩ (at 500 V DC)   |
| Initial breakdown voltage  | Between open contacts    | 750 Vrms for 1 min. (Detection current: 10 mA)                        |
|  | Between contact and coil | 1,000 Vrms for 1 min. (Detection current: 10 mA)                      |
|  | Between contact sets     | 1,000 Vrms for 1 min. (Detection current: 10 mA)                      |
| FCC surge voltage between open contacts  |                          | 1,500 V   |
| 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. 490 m/s <sup>2</sup> {50 G}                                      |
|  | Destructive*6            | Min. 980 m/s <sup>2</sup> {100 G}                                     |
| Vibration resistance   | Functional*7             | 176.4 m/s <sup>2</sup> {18G}, 10 to 55 Hz at double amplitude of 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      | -40°C to +70°C<br>-40°F to +158°F                                     |
|  | Humidity                 | 5 to 85% R.H.   |
| Unit weight  |                          | Approx. 2 g .071 oz   |

#### 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: 1 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: 11 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).

### ORDERING INFORMATION

Ex. TF 2 — L — H — 3V

| Contact arrangement | Operating function   | Terminal shape  | Coil voltage(DC)                      |
|---------------------|--|---|---------------------------------------|
| 2:2 Form C          | Nil: Single side stable<br>L: 1 coil latching<br>L2: 2 coil latching | Nil: Standard PC board terminal<br>H: Self-clinching terminal | 3,4,5,5,6,9,12,<br>24,48 <sup>V</sup> |

<sup>48 V coil type: Single side stable only</sup>

Note: AgPd stationary contact types available for high resistance against contact sticking. When ordering, please add suffix“-3”like TF2-12V-3.

# TYPES AND COIL DATA (at 20°C 68°F)

## 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 |                       |                              |                               |                                      |                           |                             |                              |
| TF2-3 V                    | TF2-H-3 V               | 3                     | 2.25                         | 0.3                           | 26.7                                 | 112.5                     | 80                          | 4.5                          |
| TF2-4.5 V                  | TF2-H-4.5 V             | 4.5                   | 3.38                         | 0.45                          | 17.8                                 | 253                       | 80                          | 6.7                          |
| TF2-5 V                    | TF2-H-5 V               | 5                     | 3.75                         | 0.5                           | 16                                   | 312.5                     | 80                          | 7.5                          |
| TF2-6 V                    | TF2-H-6 V               | 6                     | 4.5                          | 0.6                           | 13.3                                 | 450                       | 80                          | 9                            |
| TF2-9 V                    | TF2-H-9 V               | 9                     | 6.75                         | 0.9                           | 8.9                                  | 1,012.5                   | 80                          | 13.5                         |
| TF2-12 V                   | TF2-H-12 V              | 12                    | 9                            | 1.2                           | 6.7                                  | 1,800                     | 80                          | 18                           |
| TF2-24 V                   | TF2-H-24 V              | 24                    | 18                           | 2.4                           | 5.8                                  | 4,100                     | 140                         | 36                           |
| TF2-48 V                   | TF2-H-48 V              | 48                    | 36                           | 4.8                           | 5.4                                  | 8,860                     | 260                         | 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 |                       |                          |                            |                                      |                           |                             |                              |
| TF2-L-3 V                  | TF2-L-H-3 V             | 3                     | 2.25                     | 2.25                       | 18.3                                 | 163.6                     | 55                          | 4.5                          |
| TF2-L-4.5 V                | TF2-L-H-4.5 V           | 4.5                   | 3.38                     | 3.38                       | 12.2                                 | 368.2                     | 55                          | 6.7                          |
| TF2-L-5 V                  | TF2-L-H-5 V             | 5                     | 3.75                     | 3.75                       | 11                                   | 454.5                     | 55                          | 7.5                          |
| TF2-L-6 V                  | TF2-L-H-6 V             | 6                     | 4.5                      | 4.5                        | 9.2                                  | 654.5                     | 55                          | 9                            |
| TF2-L-9 V                  | TF2-L-H-9 V             | 9                     | 6.75                     | 6.75                       | 6.1                                  | 1,472                     | 55                          | 13.5                         |
| TF2-L-12 V                 | TF2-L-H-12 V            | 12                    | 9                        | 9                          | 4.6                                  | 2,618                     | 55                          | 18                           |
| TF2-L-24 V                 | TF2-L-H-24 V            | 24                    | 18                       | 18                         | 4.2                                  | 5,760                     | 100                         | 36                           |

## 3. 2 Coil latching

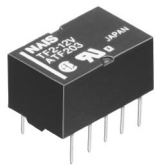
| Part No.                   |                         | Nominal voltage, V DC | Set voltage, V DC (max.) | Reset voltage, V DC (max.) | Nominal operating current, mA (±10%) | Coil resistance, Ω (±10%) | Nominal operating power, mW | Max. allowable voltage, V DC |
|----------------------------|-------------------------|-----------------------|--------------------------|----------------------------|--------------------------------------|---------------------------|-----------------------------|------------------------------|
| Standard PC board terminal | Self-clinching terminal |                       |                          |                            |                                      |                           |                             |                              |
| TF2-L2-3 V                 | TF2-L2-H-3 V            | 3                     | 2.25                     | 2.25                       | 36.7                                 | 81.8                      | 110                         | 4.5                          |
| TF2-L2-4.5 V               | TF2-L2-H-4.5 V          | 4.5                   | 3.38                     | 3.38                       | 24.4                                 | 184.1                     | 110                         | 6.7                          |
| TF2-L2-5 V                 | TF2-L2-H-5 V            | 5                     | 3.75                     | 3.75                       | 22                                   | 227.3                     | 110                         | 7.5                          |
| TF2-L2-6 V                 | TF2-L2-H-6 V            | 6                     | 4.5                      | 4.5                        | 18.3                                 | 327.3                     | 110                         | 9                            |
| TF2-L2-9 V                 | TF2-L2-H-9 V            | 9                     | 6.75                     | 6.75                       | 12.2                                 | 736.4                     | 110                         | 13.5                         |
| TF2-L2-12 V                | TF2-L2-H-12 V           | 12                    | 9                        | 9                          | 9.2                                  | 1,309                     | 110                         | 18                           |
| TF2-L2-24 V                | TF2-L2-H-24 V           | 24                    | 18                       | 18                         | 8.3                                  | 2,880                     | 200                         | 36                           |

**Notes:**

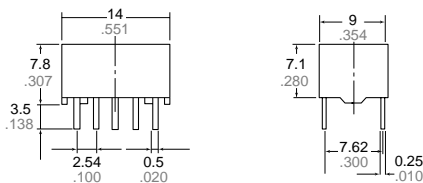
1. Specified value of the pick-up, drop-out, set and reset voltage is with the condition of square wave coil pulse.
2. Standard packing: Tube: 50 pcs.; Case: 1,000 pcs.
3. In case of 5 V drive circuit, it is recommended to use 4.5 V type relay.
4. AgPd stationary contact types available for high resistance against contact sticking. When ordering, please add suffix "-3" like TF2-12V-3.

# DIMENSIONS

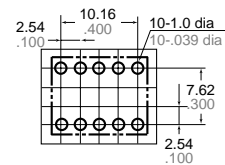
mm inch



Standard PC board terminal

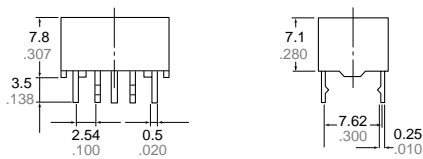


PC board pattern (Copper-side view)

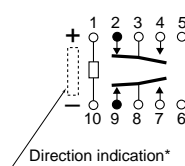


Tolerance: ±0.1 ±.004

Self-clinching terminal

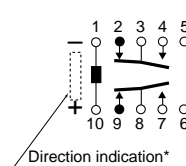


Single side stable (Deenergized condition)

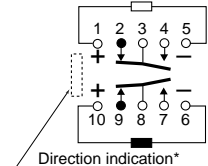


Schematic (Bottom view)

1-coil latching (Reset condition)



2-coil latching (Reset condition)

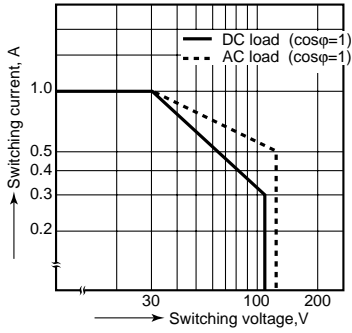


General tolerance: ±0.3 ±.012

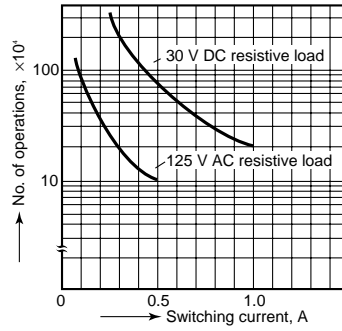
\*Orientation stripe typical-located on top of relay.

# REFERENCE DATA

## 1. Maximum switching capacity

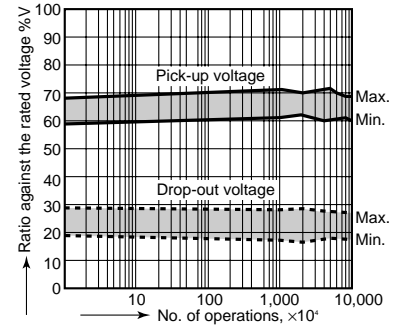


## 2. Life curve



## 3. Mechanical life

Tested sample: TF2-12V, 10 pcs.

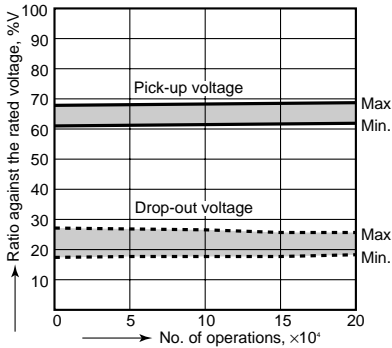


## 4.-(1) Electrical life (DC load)

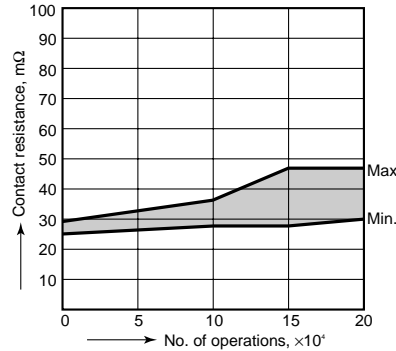
Tested sample: TF2-12V, 6 pcs.

Condition: 1 A 30 V DC resistive load, 20 cpm

Change of pick-up and drop-out voltage



Change of contact resistance

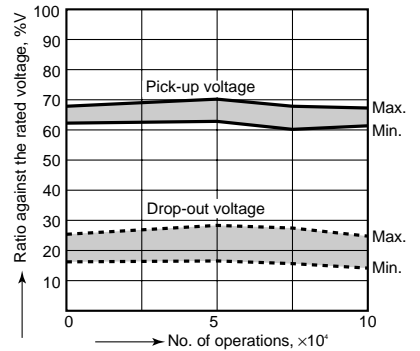


## 4.-(2) Electrical life (AC load)

Tested sample: TF2-12V, 6 pcs

Condition: 0.5 A 125 V AC resistive load, 20 cpm

Change of pick-up and drop-out voltage



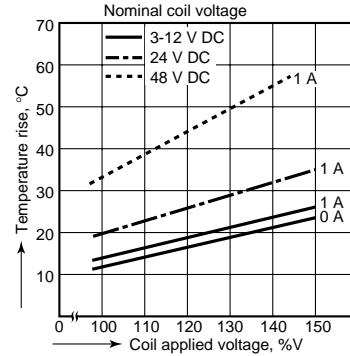
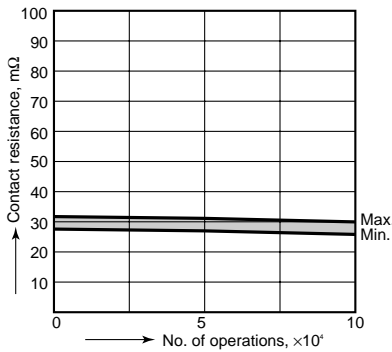
## 5. Coil temperature rise

Tested sample: TF2-xxV

Measured portion: Inside the coil

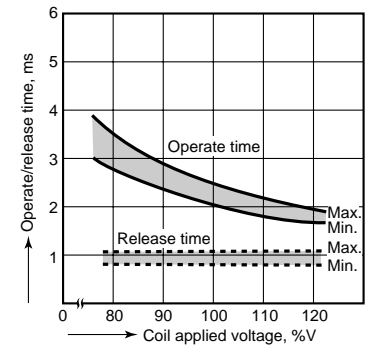
Ambient temperature: 30°C 86°F

Change of contact resistance



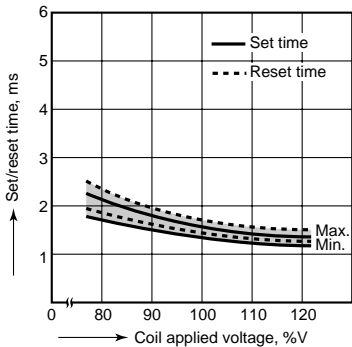
## 6. Operate/release time characteristics

Tested sample: TF2-12V, 5 pcs.



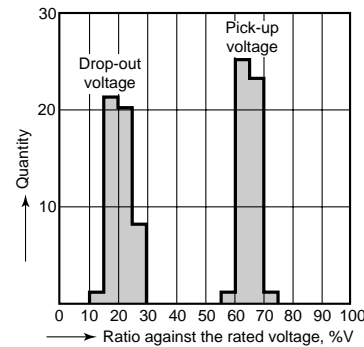
## 7. Set/reset time characteristics

Tested sample: TF2-L2-12V, 5 pcs.



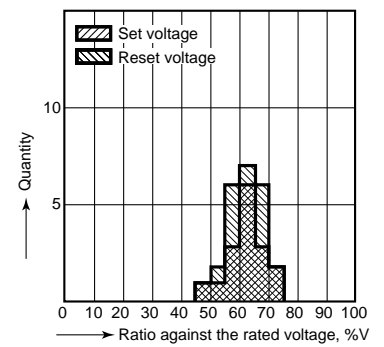
## 8. Distribution of pick-up and drop-out voltage

Tested sample: TF2-12V, 50 pcs.

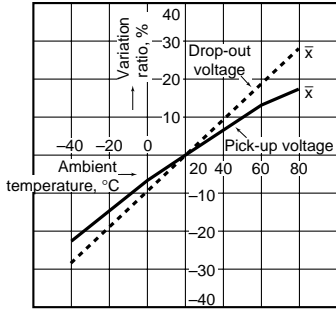


## 9. Distribution of set and reset voltage

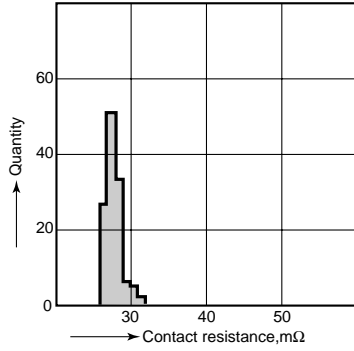
Tested sample: TF2-L2-12V, 20 pcs.



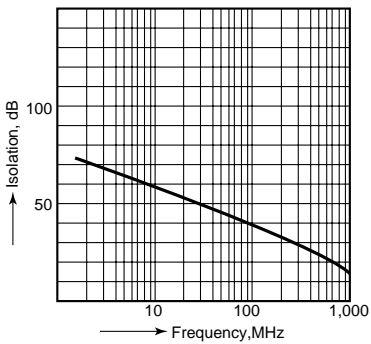
10. Ambient temperature characteristics  
Tested sample: TF2-12V, 5 pcs.



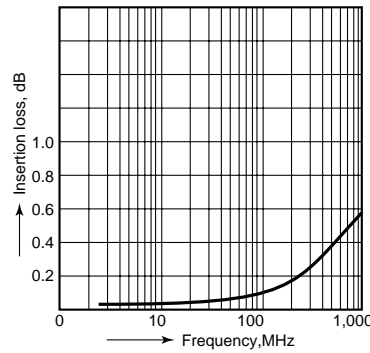
11. Distribution of contact resistance  
Tested sample: TF2-12V, 30 pcs. (30, ×4 contacts)



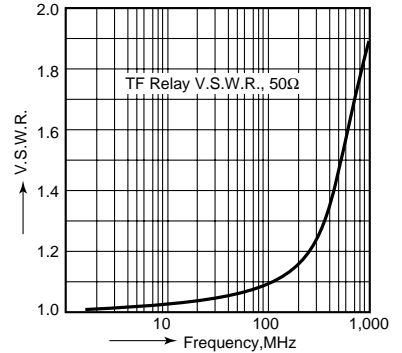
12.-(1) High-frequency characteristics  
Tested sample: TF2-xxV  
Isolation characteristics



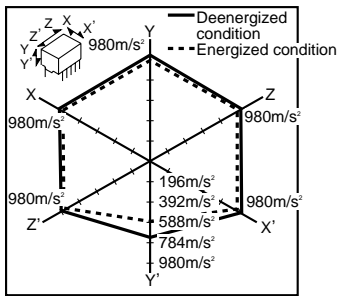
12.-(2) High-frequency characteristics  
Tested sample: TF2-xxV  
Insertion loss characteristics



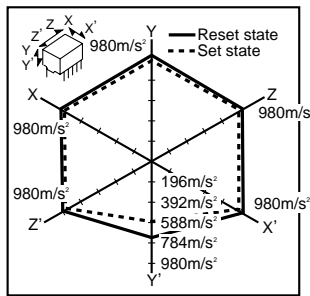
12.-(3) High-frequency characteristics  
Tested sample: TF2-xxV  
V.S.W.R.



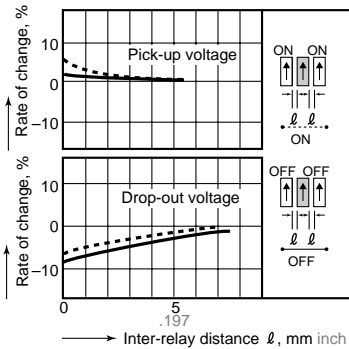
13.-(1) Malfunctional shock (single side stable)  
Tested sample: TF2-12V, 6 pcs



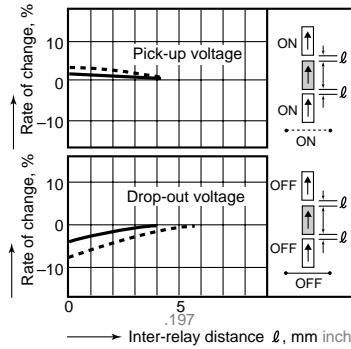
13.-(2) Malfunctional shock (latching)  
Tested sample: TF2-L-12V, 6 pcs.



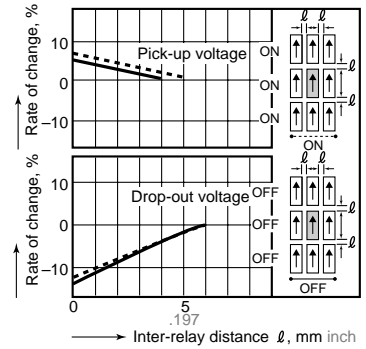
14.-(1) Influence of adjacent mounting



14.-(2) Influence of adjacent mounting



14.-(3) Influence of adjacent mounting

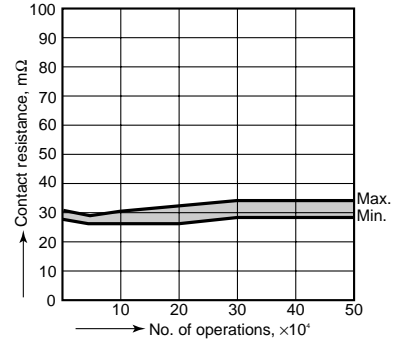
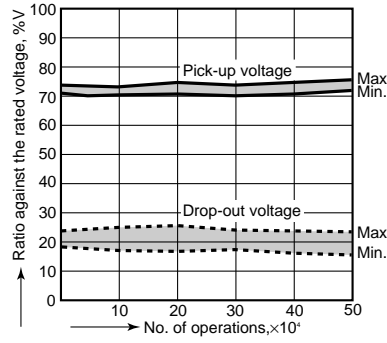
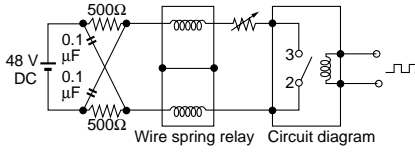


15. Actual load test  
 Tested sample: TF2-12V  
 (35 mA 48 V DC wire spring relay load)

Change of pick-up and drop-out voltage

Change of contact resistance

Circuit



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