

TMP type

PCB type

mm inch

## FEATURES

### 1. Ideal for compressor and inverter loads

- Compressor load: 20A 250V AC
- Inverter load: 20A 100V AC, 10A 200V AC

### 2. High insulation resistance

- Creepage distance and clearances between contact and coil; Creepage Min. 9.5mm .374inch/ Clearance Min. 8mm .315inch
- Surge withstand voltage: Min. 10,000V

### 3. "PCB" and "TMP" types available

### 4. Conforms to the various safety standards:

UL/CSA, TÜV, VDE approved

## SPECIFICATIONS

### Contact

|   |   |                     |
|---|---|---------------------|
| Arrangement   | 1 Form A                                |                     |
| Initial contact resistance, max. (By voltage drop 6 V DC 1 A) | 100 mΩ                                  |                     |
| Contact material  | AgSnO <sub>2</sub> type                 |                     |
| Rating (resistive load)                                       | Nominal switching capacity              | 20 A 250V AC        |
|   | Max. switching power                    | 6,250 V A           |
|   | Max. switching voltage                  | 250V AC             |
|   | Max. switching current                  | 25 A                |
|   | Min. switching capacity <sup>#1</sup>   | 100 mA, 5 V DC      |
| Expected life (min. operations)                               | Mechanical (at 180 cpm)                 | 2 × 10 <sup>6</sup> |
|   | Electrical (at 20 cpm) (Resistive load) | 10 <sup>5</sup>     |

### Coil

|                         |        |
|-------------------------|--------|
| Nominal operating power | 900 mW |
|-------------------------|--------|

<sup>#1</sup> 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.

### Remarks

- \* Specifications will vary with foreign standards certification ratings.
- \*<sup>1</sup> Measurement at same location as "Initial breakdown voltage" section.
- \*<sup>2</sup> Detection current: 10mA
- \*<sup>3</sup> Wave is standard shock voltage of  $\pm 1.2 \times 50\mu\text{s}$  according to JEC-212-1981
- \*<sup>4</sup> Excluding contact bounce time.
- \*<sup>5</sup> Half-wave pulse of sine wave: 11 ms; detection time: 10  $\mu\text{s}$
- \*<sup>6</sup> Half-wave pulse of sine wave: 6 ms
- \*<sup>7</sup> Detection time: 10  $\mu\text{s}$
- \*<sup>8</sup> Refer to 6. Conditions for operation, transport and storage mentioned in [AMBIENT ENVIRONMENT](#) (p. 19, [Relay Technical Information](#)).

### Characteristics

|  |   |   |
|--|---|---|
| Max. operating speed (at rated load)   | 20 cpm  |   |
| Initial insulation resistance <sup>*1</sup>  | Min. 1,000 MΩ (at 500 V DC)   |   |
| Initial breakdown voltage <sup>*2</sup>  | Between open contacts   | 1,000 Vrms for 1 min.                   |
|  | Between contacts and coil   | 5,000 Vrms for 1 min.                   |
| Surge voltage between contact and coil <sup>*3</sup>   | Min. 10,000 V   |   |
| Operate time <sup>*4</sup> (at nominal voltage)  | Max. 20 ms (at 20°C 68°F)   |   |
| Release time (without diode) <sup>*4</sup> (at nominal voltage)  | Max. 15 ms (at 20°C 68°F)   |   |
| Temperature rise (at nominal voltage)  | Max. 45°C (resistance method, contact current 20 A, rated coil voltage, 60°C 140°F) |   |
| Shock resistance   | Functional <sup>*5</sup>  | Min. 100 m/s <sup>2</sup> {10 G}        |
|  | Destructive <sup>*6</sup>   | Min. 1,000 m/s <sup>2</sup> {100 G}     |
| Vibration resistance   | Functional <sup>*7</sup>  | 10 to 55Hz at double amplitude of 1.5mm |
|  | Destructive   | 10 to 55Hz at double amplitude of 1.5mm |
| Conditions for operation, transport and storage <sup>*8</sup> (Not freezing and condensing at low temperature) | Ambient temp.   | -40°C to +60°C<br>-40°F to +140°F       |
|  | Humidity  | 5 to 85% R.H.                           |
| Unit weight  | Approx. 23 g .81 oz   |   |

## TYPICAL APPLICATIONS

- Air conditioner
- Refrigerators
- OA equipment

## ORDERING INFORMATION

Ex. 

|   |    |   |   |    |
|---|----|---|---|----|
| A | LF | 1 | T | 12 |
|---|----|---|---|----|

| Product Name | Contact arrangement | Terminal shape | Coil voltage, V DC |
|--------------|---------------------|----------------|--------------------|
| LF           | 1: 1 Form A         | T: TMP type    | 05: 5    12: 12    |
|              |                     | P: PCB type    | 06: 6    18: 18    |
|              |                     |                | 09: 9    24: 24    |

Note: Standard packing; Carton: 50 pcs. Case 200 pcs. UL/CSA, VDE, TÜV approved type is standard.

# LF (ALF)

## TYPES

| Contact arrangement | Coil voltage, V DC | TMP type | PCB type |
|---------------------|--------------------|----------|----------|
| 1 Form A            | 5                  | ALF1T05  | ALF1P05  |
|                     | 6                  | ALF1T06  | ALF1P06  |
|                     | 9                  | ALF1T09  | ALF1P09  |
|                     | 12                 | ALF1T12  | ALF1P12  |
|                     | 18                 | ALF1T18  | ALF1P18  |
|                     | 24                 | ALF1T24  | ALF1P24  |

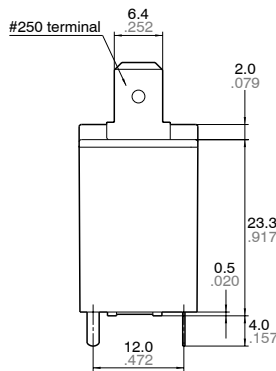
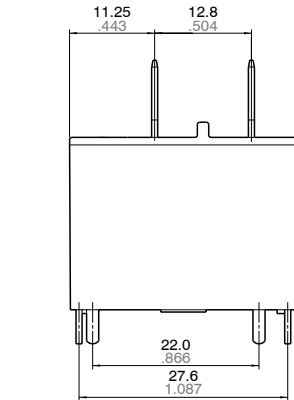
## COIL DATA

| Nominal voltage, V DC | Pick-up voltage, V DC (max.) | Drop-out voltage, V DC (min.) | Coil resistance, $\Omega$ ( $\pm 10\%$ ) | Nominal operating current, mA ( $\pm 10\%$ ) | Nominal operating power, W | Maximum allowable voltage, V DC |
|-----------------------|------------------------------|-------------------------------|--|--|----------------------------|---------------------------------|
| 5                     | 3.5                          | 0.5                           | 27.8                                     | 180  | 0.9                        | 5.5                             |
| 6                     | 4.2                          | 0.6                           | 40                                       | 150  |                            | 6.6                             |
| 9                     | 6.3                          | 0.9                           | 90                                       | 100  |                            | 9.9                             |
| 12                    | 8.4                          | 1.2                           | 160                                      | 75   |                            | 13.2                            |
| 18                    | 12.6                         | 1.8                           | 360                                      | 50   |                            | 19.8                            |
| 24                    | 16.8                         | 2.4                           | 640                                      | 37.5   |                            | 26.4                            |

## DIMENSIONS

mm inch

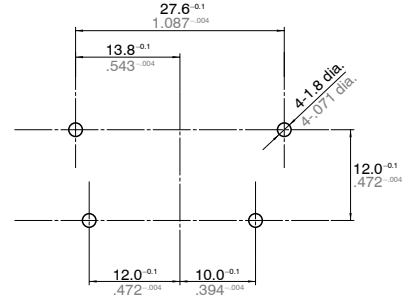
### 1. TMP type



**Dimension:**  
 Max. 1mm .039 inch:  
 1 to 3mm .039 to .118 inch:  
 Min. 3mm .118 inch:

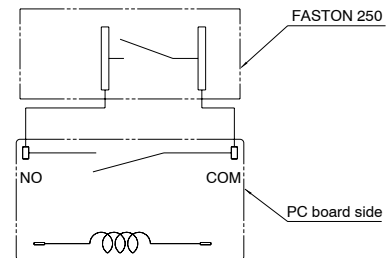
**Tolerance**  
 $\pm 0.1 \pm 0.04$   
 $\pm 0.2 \pm 0.08$   
 $\pm 0.3 \pm 0.12$

### PC board pattern (Bottom view)

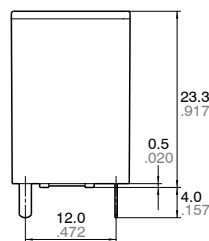
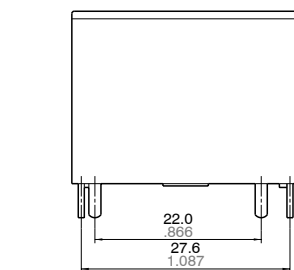


Tolerance:  $\pm 0.1 \pm 0.04$

### Schematic (Bottom view)



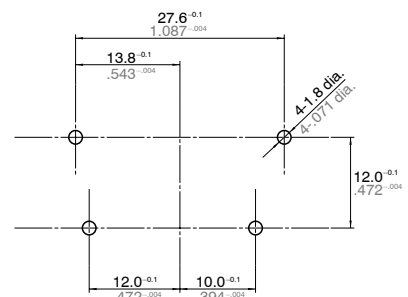
### 2. PCB type



**Dimension:**  
 Max. 1mm .039 inch:  
 1 to 3mm .039 to .118 inch:  
 Min. 3mm .118 inch:

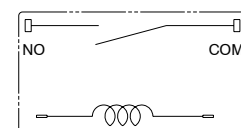
**Tolerance**  
 $\pm 0.1 \pm 0.04$   
 $\pm 0.2 \pm 0.08$   
 $\pm 0.3 \pm 0.12$

### PC board pattern (Bottom view)



Tolerance:  $\pm 0.1 \pm 0.04$

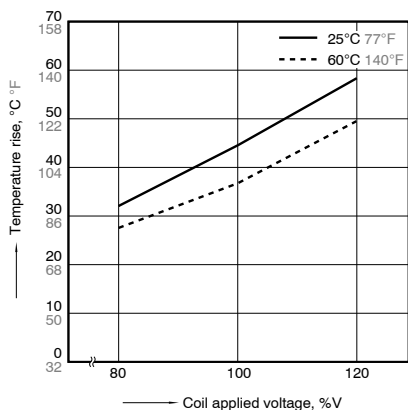
### Schematic (Bottom view)



## REFERENCE DATA

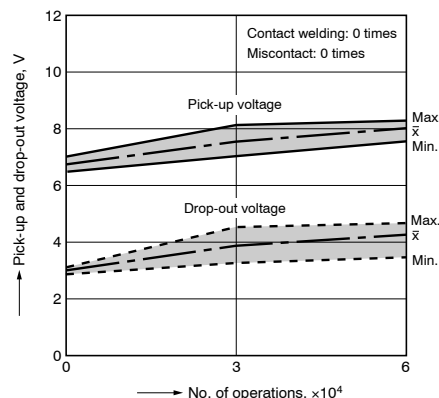
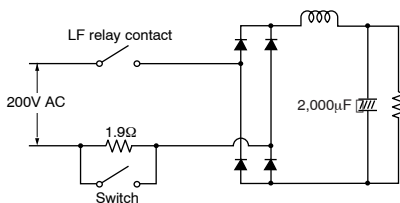
### 1. Coil temperature rise

Sample: ALF1T12, 6 pcs.  
 Point measured: coil inside  
 Contact current: 20A  
 Ambient temperature: 25°C 77°F, 60°C 140°F



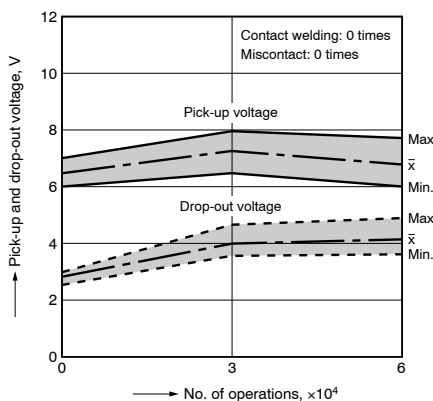
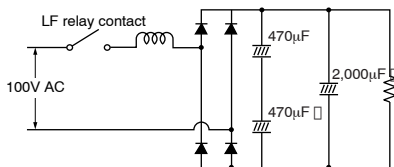
### 2-(1). 200V AC electrical life test

(200V AC, inverter load)  
 Sample: ALF1T12, 6 pcs.  
 Load: Inrush 102A (wave peak value),  
 Steady 14.4A (wave peak value)  
 Inverter dummy 200V AC  
 Switching frequency: ON 1s, OFF 5s  
 Circuit:



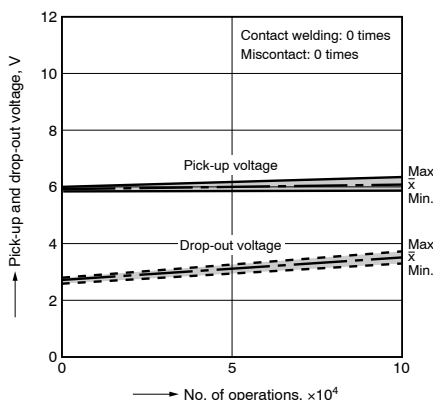
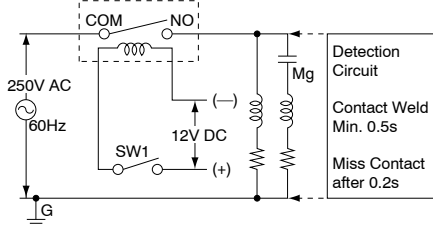
### 2-(2). 100V AC electrical life test

(100V AC, inverter load)  
 Sample: ALF1T12, 6 pcs.  
 Load: Inrush 224A (wave peak value),  
 Steady 30.5A (wave peak value)  
 Inverter dummy 100V AC  
 Switching frequency: ON 1s, OFF 5s  
 Circuit:



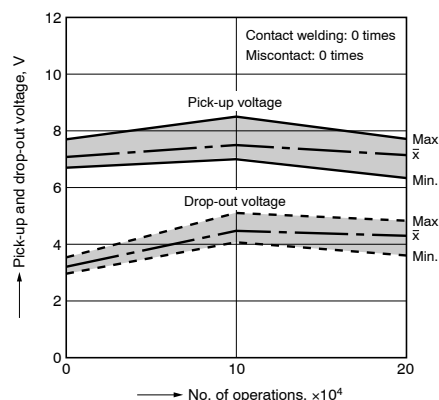
### 2-(3). Inrush 70.7A, Steady 20A, 250V AC electrical life test (Compressor dummy load)

Sample: ALF1T12, 3 pcs.  
 Load: Inrush 70.7A, cosφ = 0.7  
 Steady 20A, cosφ 0.9  
 250V AC compressor dummy  
 Switching frequency: ON 1.5s, OFF 1.5s  
 Circuit:



### 2-(4). Electrical life test (20A 250V AC, resistive load)

Sample: ALF1T12, 6 pcs.  
 Switching frequency: ON 1.5s, OFF 1.5s



For Cautions for Use, see [Relay Technical Information](#).