**FEATURES**

1. **Ideal for compressor and inverter loads**
   - 1) Compressor load: 20A 250V AC
   - 2) Inverter load: 20A 100V AC, 10A 200V AC

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

3. “PCB” and “TMP” types available

4. Conforms to the various safety standards:
   - UL/C-UL, TÜV and VDE approved

**ORDERING INFORMATION**

**ALF 1**

- Contact arrangement: 1 Form A
- Terminal shape: T - TMP type, P - PCB type
- Nominal coil voltage (DC): 05: 5V, 06: 6V, 09: 9V, 12: 12V, 18: 18V, 24: 24V

Note: Certified by UL/C-UL, VDE and TÜV

**TYPICAL APPLICATIONS**

1. Air conditioner
2. Refrigerators
3. OA equipment

**TYPES**

<table>
<thead>
<tr>
<th>Contact arrangement</th>
<th>Nominal coil voltage</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Form A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5V DC</td>
<td>ALF1T05</td>
</tr>
<tr>
<td></td>
<td>6V DC</td>
<td>ALF1T06</td>
</tr>
<tr>
<td></td>
<td>9V DC</td>
<td>ALF1T09</td>
</tr>
<tr>
<td></td>
<td>12V DC</td>
<td>ALF1T12</td>
</tr>
<tr>
<td></td>
<td>18V DC</td>
<td>ALF1T18</td>
</tr>
<tr>
<td></td>
<td>24V DC</td>
<td>ALF1T24</td>
</tr>
</tbody>
</table>

Note: Certified by UL/C-UL, VDE and TÜV

Standard packing: Carton 50 pcs., Case 200 pcs.
1. Coil data

- Operating characteristics such as ‘Operate voltage’ and ‘Release voltage’ are influenced by mounting conditions, ambient temperature, etc.
- ‘Initial’ means the condition of products at the time of delivery.

### Specifications

#### Contact
- Nominal coil voltage
  - 5V DC: 70%V or less of nominal voltage, 10%V or more of nominal voltage (Initial)
  - 6V DC: 70%V or less of nominal voltage, 10%V or more of nominal voltage (Initial)
  - 9V DC: 70%V or less of nominal voltage, 10%V or more of nominal voltage (Initial)
  - 12V DC: 70%V or less of nominal voltage, 10%V or more of nominal voltage (Initial)
  - 18V DC: 70%V or less of nominal voltage, 10%V or more of nominal voltage (Initial)
  - 24V DC: 70%V or less of nominal voltage, 10%V or more of nominal voltage (Initial)

#### Rating
- Nominal switching capacity (resistive load)
  - 20A, 250V AC

#### Electrical characteristics
- Insulation resistance (Initial): Min. 1,000MΩ (at 500V DC)
- Breakdown voltage (Initial)
  - Between open contacts: 1,000 Vrms for 1 min. (Detection current: 10 mA)
  - Between contact and coil: 5,000 Vrms for 1 min. (Detection current: 10 mA)

#### Mechanical characteristics
- Shock resistance (Functional): 100 m/s² (Half-wave pulse of sine wave: 11 ms; detection time: 10 μs.)
- Vibration resistance (Functional): 10 to 55 Hz at double amplitude of 1.5 mm (Detection time: 10 μs.)

#### Expected life
- Mechanical: (at 180 times/min.) Min. 2×10⁶
- Electrical: (at 20 times/min.) Min. 10⁷ (resistive load)

#### Conditions
- Conditions for operation, transport and storage:
  - Ambient temperature: −40°C to +60°C, −40°F to +140°F.
  - Relative humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature)
- Max. operating speed: 20 times/min. (at nominal switching capacity)

#### Unit weight
- Approx. 23 g (81 oz)

*Specifications will vary with foreign standards certification ratings.

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 of the ambient temperature is the maximum temperature that can satisfy the coil temperature rise value. Refer to Usage, transport and storage conditions in NOTES.
- *3. 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.
REFERENCE DATA

1. Coil temperature rise
Tested sample: ALF1T12, 6 pcs.
Measured portion: Coil inside
Contact current: 20A
Ambient temperature: 25°C, 60°C

2-(1). 200V AC electrical life test
(200V AC, inverter load)
Tested sample: ALF1T12, 6 pcs.
Load: Inrush 102A (wave peak value), Steady 14.4A (wave peak value)
Inverter dummy 200V AC
Operation frequency: ON: 1s, OFF: 5s
Circuit:

Change of operate and release voltage

2-(2). 100V AC electrical life test
(100V AC, inverter load)
Tested sample: ALF1T12, 6 pcs.
Load: Inrush 224A (wave peak value), Steady 30.5A (wave peak value)
Inverter dummy 100V AC
Operation frequency: ON: 1s, OFF: 5s
Circuit:

Change of operate and release voltage

2-(3). Inrush 70.7A, Steady 20A, 250V AC
electrical life test (Compressor dummy load)
Tested sample: ALF1T12, 6 pcs.
Load: Inrush 70.7A, cosφ=0.7
Steady 20A, cosφ=0.9
Compressor dummy 250V AC
Operation frequency: ON: 1.5s, OFF: 1.5s
Circuit:

Change of operate and release voltage

2-(4). Electrical life test
(20A 250V AC, resistive load)
Tested sample: ALF1T12, 6 pcs.
Operation frequency: ON: 1.5s, OFF: 1.5s
Circuit:

Change of operate and release voltage
**DIMENSIONS (mm)**

1. **TMP type**

![Schematic (Bottom view)](image1)

**External dimensions**

- General tolerance
  - Less than 1mm: ±0.1
  - Min. 1mm less than 3mm: ±0.2
  - Min. 3mm: ±0.3

**PC board pattern (Bottom view)**

![PC board pattern (Bottom view)](image2)

**PC board side**

**Schematic (Bottom view)**

![Schematic (Bottom view)](image3)

2. **PCB type**

![Schematic (Bottom view)](image4)

**External dimensions**

- General tolerance
  - Less than 1mm: ±0.1
  - Min. 1mm less than 3mm: ±0.2
  - Min. 3mm: ±0.3

**PC board pattern (Bottom view)**

![PC board pattern (Bottom view)](image5)

**Schematic (Bottom view)**

**SAFETY STANDARDS**

<table>
<thead>
<tr>
<th>UL/C-UL (Recognized)</th>
<th>VDE (Certified)</th>
<th>TUV (Certified)</th>
<th>TV rating (UL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E43028</td>
<td>20A 277V AC</td>
<td>60°C</td>
<td>10°F</td>
</tr>
<tr>
<td>20A 277V AC</td>
<td>60°C</td>
<td>10°F</td>
<td>—</td>
</tr>
</tbody>
</table>

* CSA standard: Certified by C-UL

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EN/IEC VDE Certified

INSULATION CHARACTERISTICS (IEC61810-1)

<table>
<thead>
<tr>
<th>Item</th>
<th>Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearance/Creepage distance (IEC61810-1)</td>
<td>Min. 5.5mm/5.5mm</td>
</tr>
<tr>
<td>Category of protection (IEC61810-1)</td>
<td>RT II</td>
</tr>
<tr>
<td>Tracking resistance (IEC60112)</td>
<td>PTI 175</td>
</tr>
<tr>
<td>Insulation material group</td>
<td>III a</td>
</tr>
<tr>
<td>Over voltage category</td>
<td>III</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>250V</td>
</tr>
<tr>
<td>Pollution degree</td>
<td>2</td>
</tr>
<tr>
<td>Type of insulation (Between contact and coil)</td>
<td>Reinforced insulation</td>
</tr>
<tr>
<td>Type of insulation (Between open contacts)</td>
<td>Micro disconnection</td>
</tr>
</tbody>
</table>

NOTES

1. For cautions for use, please read “GENERAL APPLICATION GUIDELINES”.

Please refer to "the latest product specifications" when designing your product.
- Requests to customers:
  https://industrial.panasonic.com/ac/e/salespolicies/
GUIDELINES FOR POWER RELAYS AND HIGH-CAPACITY DC CUT OFF RELAYS USAGE

For cautions for use, please read “GUIDELINES FOR RELAY USAGE”.
https://industrial.panasonic.com/ac/e/control/relay/cautions_use/index.jsp

Precautions for Coil Input

Long term current carrying
A circuit that will be carrying a current continuously for long periods without relay switching operation. (circuits for emergency lamps, alarm devices and error inspection that, for example, revert only during malfunction and output warnings with form B contacts) Continuous, long-term current to the coil will facilitate deterioration of coil insulation and characteristics due to heating of the coil itself.
For circuits such as these, please use a magnetic-hold type latching relay. If you need to use a single stable relay, use a sealed type relay that is not easily affected by ambient conditions and make a failsafe circuit design that considers the possibility of contact failure or disconnection.

DC Coil operating power
Steady state 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, please check with the actual circuit since the electrical characteristics may vary. The rated coil voltage should be applied to the coil and the set/reset pulse time of latching type relay differs for each relays, please refer to the relay’s individual specifications.

Coil connection
When connecting coils of polarized relays, please check coil polarity (+,-) at the internal connection diagram (Schematic). If any wrong connection is made, it may cause unexpected malfunction, like abnormal heat, fire and so on, and circuit do not work. Avoid impressing voltages to the set coil and reset coil at the same time.

Ambient Environment

Usage, Transport, and Storage Conditions
During usage, storage, or transportation, avoid locations subjected to direct sunlight and maintain normal temperature, humidity and pressure conditions.

Temperature/Humidity/Pressure
When transporting or storing relays while they are tube packaged, there are cases the temperature may differ from the allowable range. In this case be sure to check the individual specifications. Also allowable humidity level is influenced by temperature, please check charts shown below and use relays within mentioned conditions. (Allowable temperature values differ for each relays, please refer to the relay's individual specifications.)

1) Temperature:
The tolerance temperature range differs for each relays, please refer to the relay’s individual specifications
2) Humidity:
5 to 85 % RH
3) Pressure:
86 to 106 kPa

Dew condensation
Condensation occurs when the ambient temperature drops suddenly from a high temperature and humidity, or the relay is suddenly transferred from a low ambient temperature to a high temperature and humidity. Condensation causes the failures like insulation deterioration, wire disconnection and rust etc. Panasonic Corporation does not guarantee the failures caused by condensation. The heat conduction by the equipment may accelerate the cooling of device itself, and the condensation may occur. Please conduct product evaluations in the worst condition of the actual usage. (Special attention should be paid when high temperature heating parts are close to the device. Also please consider the condensation may occur inside of the device.)

Icing
Condensation or other moisture may freeze on relays when the temperature become lower than 0°C. This icing causes the sticking of movable portion, the operation delay and the contact conduction failure etc. Panasonic Corporation does not guarantee the failures caused by the icing. The heat conduction by the equipment may accelerate the cooling of relay itself and the icing may occur. Please conduct product evaluations in the worst condition of the actual usage.

Low temperature and low humidity
The plastic becomes brittle if the switch is exposed to a low temperature, low humidity environment for long periods of time.

High temperature and high humidity
Storage for extended periods of time (including transportation periods) at high temperature or high humidity levels or in atmospheres with organic gases or sulfide gases may cause a sulfide film or oxide film to form on the surfaces of the contacts and/or it may interfere with the functions. Check out the atmosphere in which the units are to be stored and transported.
GUIDELINES FOR POWER RELAYS AND HIGH-CAPACITY DC CUT OFF RELAYS USAGE

+Package
In terms of the packing format used, make every effort to keep the effects of moisture, organic gases and sulfide gases to the absolute minimum.

+Silicon
When a source of silicone substances (silicone rubber, silicone oil, silicone coating materials and silicone filling materials etc.) is used around the relay, the silicone gas (low molecular siloxane etc.) may be produced. This silicone gas may penetrate into the inside of the relay. When the relay is kept and used in this condition, silicone compound may adhere to the relay contacts which may cause the contact failure. Do not use any sources of silicone gas around the relay (Including plastic seal types).

Others

| Cleaning |
1) Although the environmentally sealed type relay (plastic sealed type, etc.) can be cleaned, avoid immersing the relay into cold liquid (such as cleaning solvent) immediately after soldering. Doing so may deteriorate the sealing performance.
2) Cleaning with the boiling method is recommended (The temperature of cleaning liquid should be 40°C or lower).
Avoid ultrasonic cleaning on relays. Use of ultrasonic cleaning may cause breaks in the coil or slight sticking of the contacts due to ultrasonic energy.

NOx Generation
When relay is used in an atmosphere high in humidity to switch a load which easily produces an arc, the NOx created by the arc and the water absorbed from outside the relay combine to produce nitric acid. This corrodes the internal metal parts and adversely affects operation. Avoid use at an ambient humidity of 85%RH or higher (at 20°C). If use at high humidity is unavoidable, please contact our sales representative.

Please refer to "the latest product specifications" when designing your product.

• Requests to customers:
  https://industrial.panasonic.com/ac/e/salespolicies/