



Catalog of Alloy Type Thermal Cutoff

Professional provider of overheating
protection solutions

Catalogue

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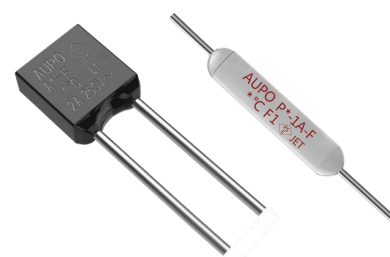
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Alloy Type Thermal Cutoff

Alloy type thermal cutoff is non-resettable thermal protection device used for overheating protection of household appliances and industrial equipment, preventing them from catching fire due to overheating. Its fully sealed structure ensures the stability and reliability of its fuse system, which is not affected by harsh environments such as external humidity.



Small
& sensitive

Accurate &
stable T_f

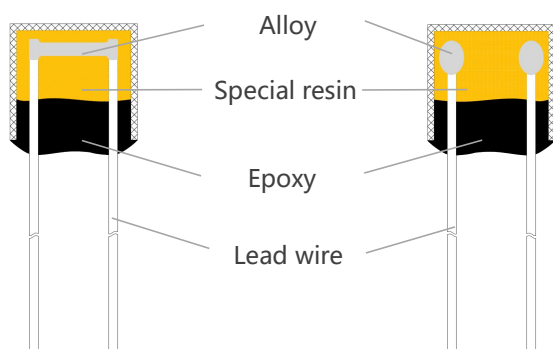
One-off
circuit cutoff

RoHS
Compliance

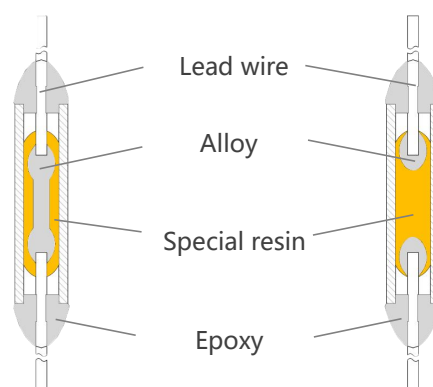
Electrical Load
& Temperature
Range acc. to
Safety
Standards

■ Principle of operation

When the temperature around the fuse rises to its functioning temperature, its fusible alloy melts and, with the help of surface tension and special resin, shrinks into a ball, attaching to the ends of the two pins, permanently cutting off the circuit.



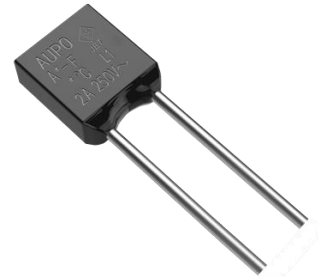
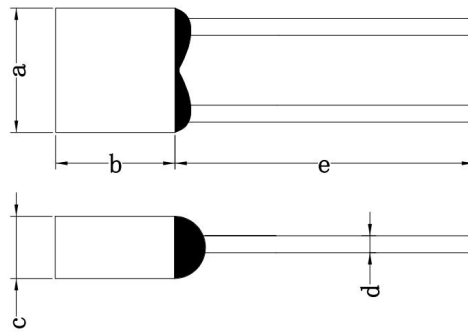
A series: before & after functioning



P series: before & after functioning

A Series

Dimension

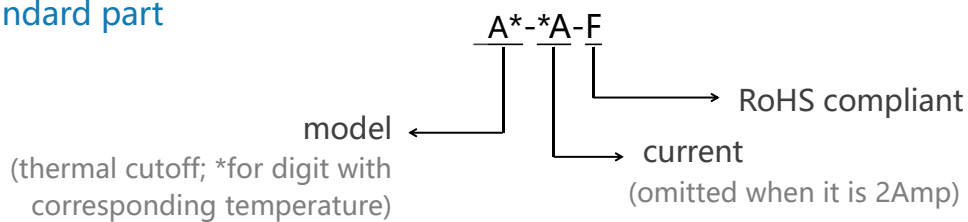


Unit: mm

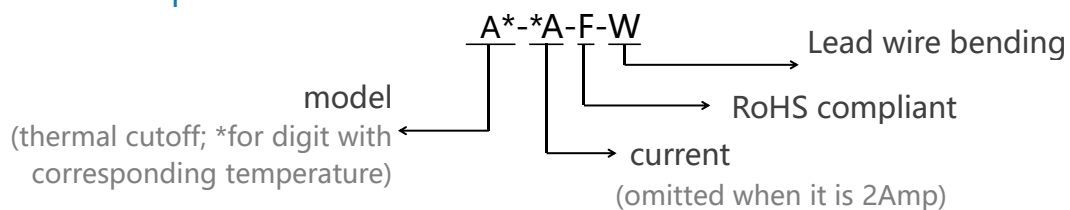
Part No.	A*-1A-F	A*-F	A*-3A-F	A*-5A-F	A*-10A-F	A*-15A-F	A*-20A-F	A*-25A-F
a	5.2 ± 0.5	6.2 ± 0.5	6.2 ± 0.5	6.6 ± 0.5	8.3 ± 0.5	8.3 ± 0.5	10.8 ± 0.5	10.8 ± 0.5
b	4.0 ± 0.5	6.3 ± 0.5	6.3 ± 0.5	8.0 ± 0.5	7.5 ± 0.5	7.5 ± 0.5	11.5 ± 0.5	11.5 ± 0.5
c	2.3 ± 0.2	2.5 ± 0.3	2.5 ± 0.3	2.6 ± 0.3	3.4 ± 0.3	3.4 ± 0.3	4.8 ± 0.3	4.8 ± 0.3
d	Φ0.54 ± 0.05	Φ0.54 ± 0.05	Φ0.6 ± 0.02	Φ0.6 ± 0.02	Φ1.0 ± 0.05	Φ1.0 ± 0.05	Φ1.6 ± 0.05	Φ1.6 ± 0.05
e	66 ± 3	64 ± 3	64 ± 3	62 ± 3	37.3 ± 3	37.3 ± 3	33.5 ± 3	33.5 ± 3

Part No.

Standard part



Customized part



■ Temperature parameters

Part No.	Tf(°C)	Functioning temp.(°C)	Th(°C)	Tm(°C)
A0-*A-F	84	82±2	65	203
A1-*A-F	102	98±3	80	203
A2-*A-F	115	112±3	99	203
A3-*A-F	125	120±3	105	203
A4-*A-F	130	126±2	107	203
A5-*A-F	135	131±3	115	203
A7-*A-F	138	135±2	118	203
A8-*A-F	150	145±3	128	203
A12-*A-F	145	140±2	126	203
A16-*A-F	160	155±2	140	203

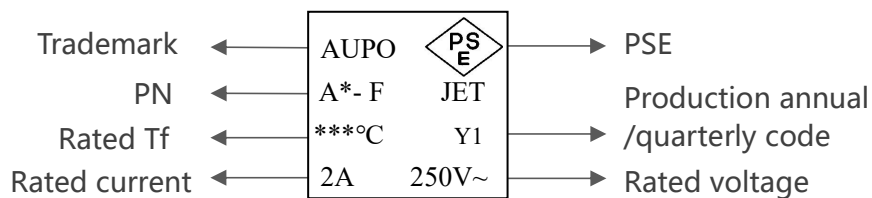
* AUPO thermal fuses are available with a wide range of rated functioning temperatures, offering customers flexibility in product selection, design, and application. Tm and Th values are based on the highest parameters established through certification; for specific certified parameters, please refer to the datasheet.

■ Electric parameters

Part No.	Tf (°C)	Rated voltage (V)	Certifications					
			UL(A)	CUL(A)	VDE(A)	PSE(A)	CCC(A)	KC(A)
A0-*A-F	84	250	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	3/5	3/5
A1-*A-F	102	250	1/2/3/5/ 10/15	1/2/3/5/ 10/15	1/2/3/5/ 10/15	1/2/3/5	1/2/3/5	1/2/3/5
A2-*A-F	115	250	1/2/3/5/ 10/15/20/25	1/2/3/5/ 10/15/20/25	1/2/3/5/ 10/15	1/2/3/5	1/2/3/5/ 10/15	1/2/3/5
A3-*A-F	125	250	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5
A4-*A-F	130	250	1/2/3/5/ 10/15/20/25	1/2/3/5/ 10/15/20/25	1/2/3/5/ 10/15	1/2/3/5	1/2/3/5/ 10/15	1/2/3/5
A5-*A-F	135	250	1/2/3/5/ 10/15/20/25	1/2/3/5/ 10/15/20/25	1/2/3/5/ 10/15	1/2/3/5	1/2/3/5	1/2/3/5
A7-*A-F	138	250	1/2/3/5/ 10/15	1/2/3/5/ 10/15	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5
A8-*A-F	150	250	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5
A12-*A-F	145	250	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5
A16-*A-F	160	250	1/2/3/5	1/2/3/5	-	1/2/3/5	1/2/3/5	-

■ Product marks

▪ Printing

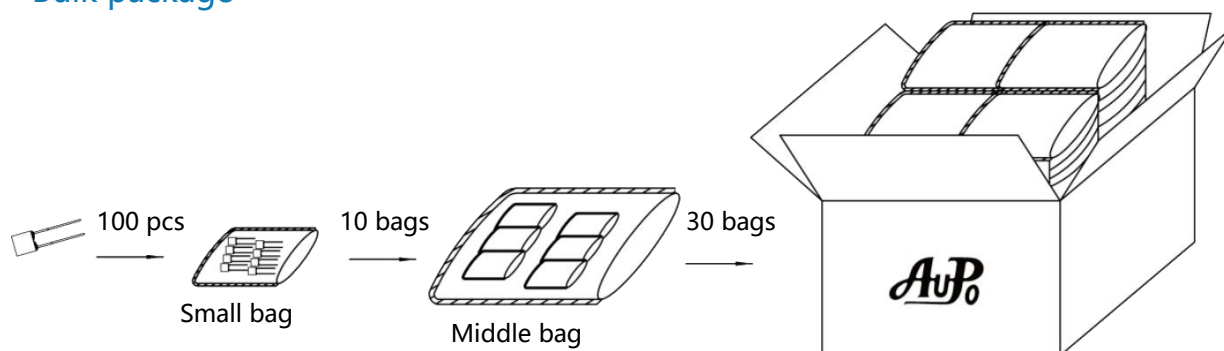


Remark: production annual/quarterly code

- 1) Y for 2011, Z for 2012, and so forth, arranged alphabetically: Y, Z, C, D, E... (excluding A, B, K, P, S, T).
- 2) 1、2、3、4 for 4 seasons of a year; for example: Y1 for 1st quarter of 2011, Y2 for 2nd quarter of 2011

■ Package

▪ Bulk package

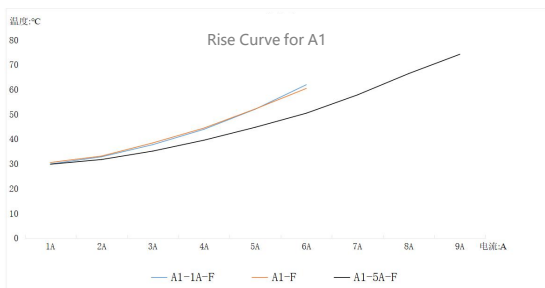


	Small bag	Middle bag	Package
Size(mm)	135x85	250x190	335x285x185
Volume(pcs)	100	1000	30000

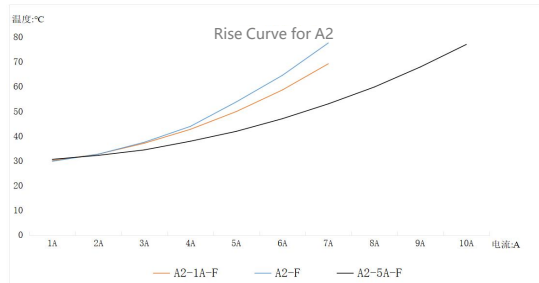
■ Performance test data

■ Temperature rise curve

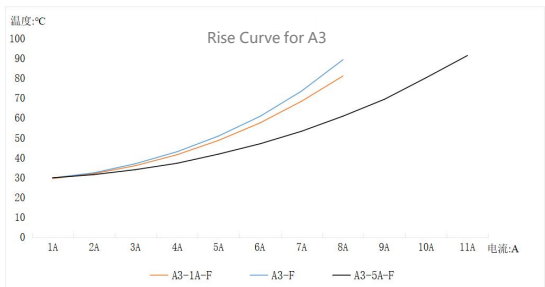
A1-*A-F (102°C)



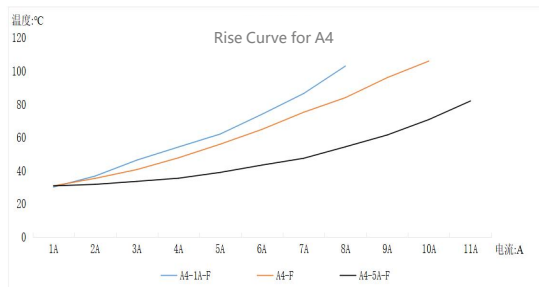
A2-*A-F (115°C)



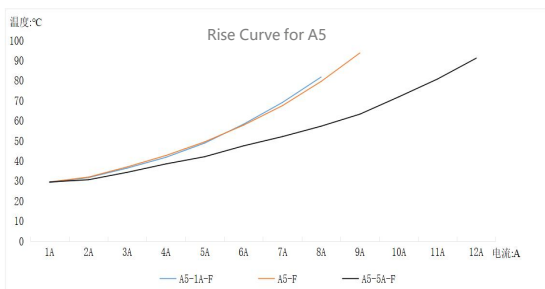
A3-*A-F (125°C)



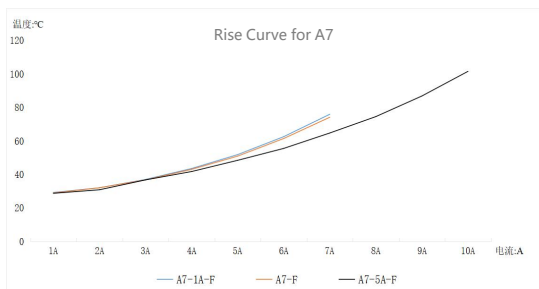
A4-*A-F (130°C)



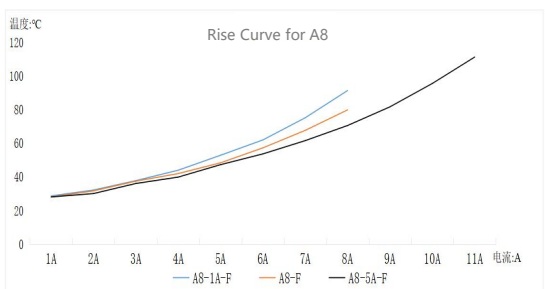
A5-*A-F (135°C)



A7-*A-F (138°C)

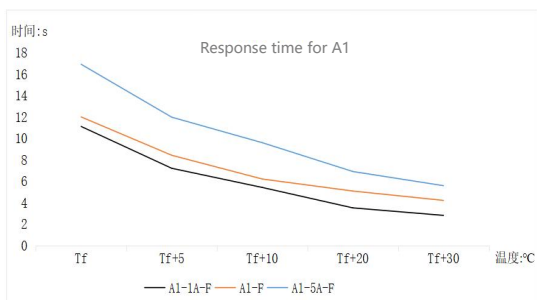


A8-*A-F (150°C)

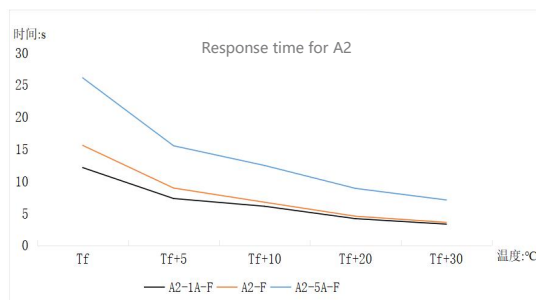


▪ Response time

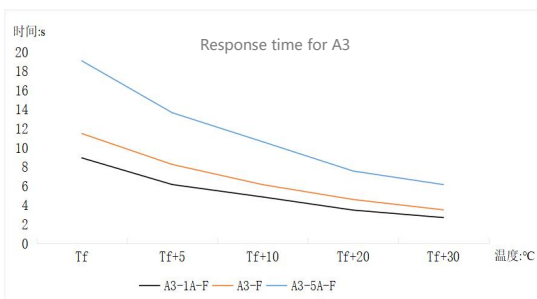
A1-*A-F (102°C)



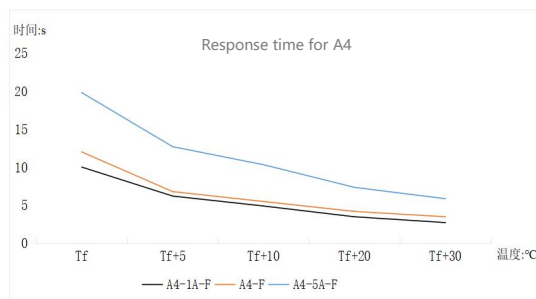
A2-*A-F (115°C)



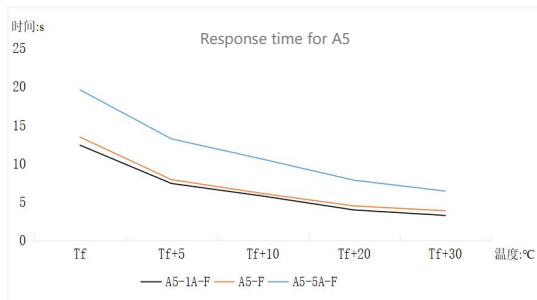
A3-*A-F (125°C)



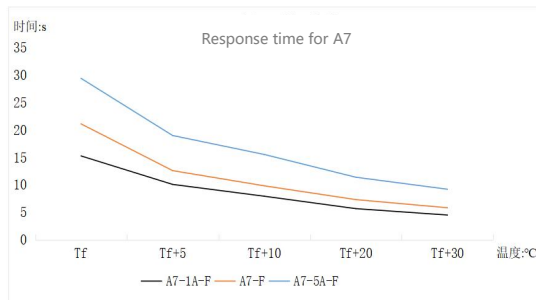
A4-*A-F (130°C)



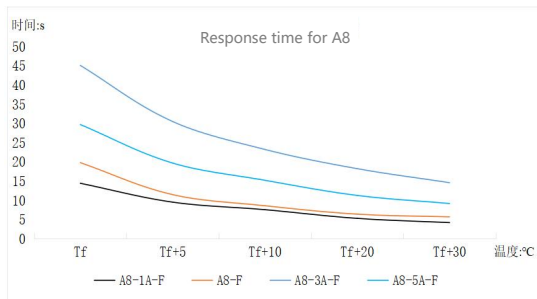
A5-*A-F (135°C)



A7-*A-F (138°C)

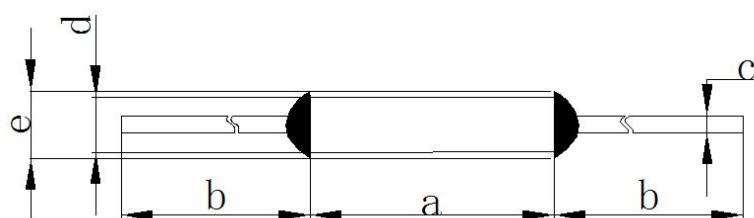


A8-*A-F (150°C)



P Series

■ Dimension

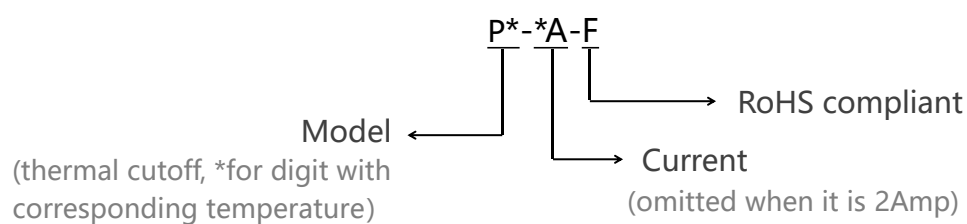


Unit: mm

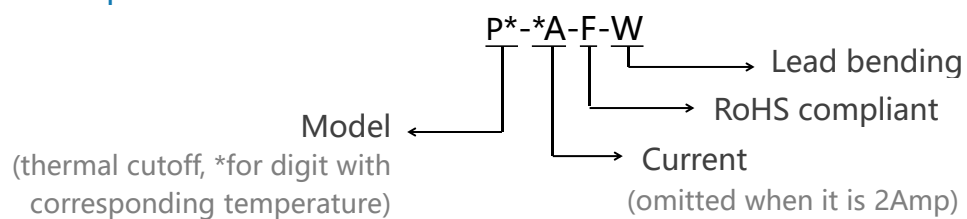
Part No.	a	b	c	d	e
P*-1A-F	6.5 ± 0.5	38 ± 3	$\Phi 0.54 \pm 0.05$	$\Phi 2.15 \pm 0.15$	2.4 or below
P*-F	9.0 ± 0.5	38 ± 3	$\Phi 0.54 \pm 0.05$	$\Phi 2.5 \pm 0.1$	3.0 or below
P*-3A-F	10.0 ± 0.5	38 ± 3	$\Phi 0.6 \pm 0.05$	$\Phi 3.0 \pm 0.1$	3.3 or below
P*-5A-F	11.5 ± 0.5	38 ± 3	$\Phi 0.6 \pm 0.05$	$\Phi 3.3 \pm 0.2$	3.6 or below

■ Part No.

▪ Standard part



▪ Customized part



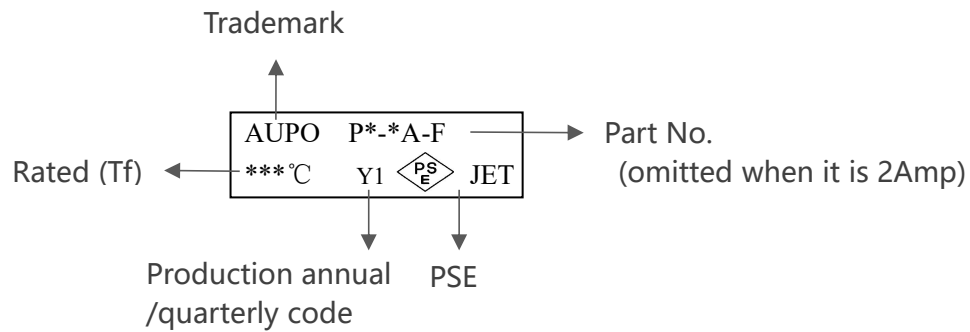
■ Temperature parameters

Part No.	Tf(°C)	Functioning temperature(°C)	Th(°C)	Tm(°C)
P1-*A-F	102	98±3	80	200
P3-*A-F	125	120±3	105	200
P4-*A-F	130	126±2	107	200
P5-*A-F	135	131±3	115	200
P9-*A-F	138	135±2	118	200
P12-*A-F	145	140±2	126	200
P7-*A-F	150	145±3	128	200

■ Electric parameters

Part No.	Tf (°C)	Rated voltage (V)	Certifications					
			UL(A)	CUL(A)	VDE(A)	PSE(A)	CCC(A)	KC(A)
P1-*A-F	102	250	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2
P2-*A-F	115	250	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2
P3-*A-F	125	250	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2
P4-*A-F	130	250	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2
P5-*A-F	135	250	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2
P9-*A-F	138	250	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2
P12-*A-F	145	250	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2
P7-*A-F	150	250	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2/3/5	1/2

Product marks

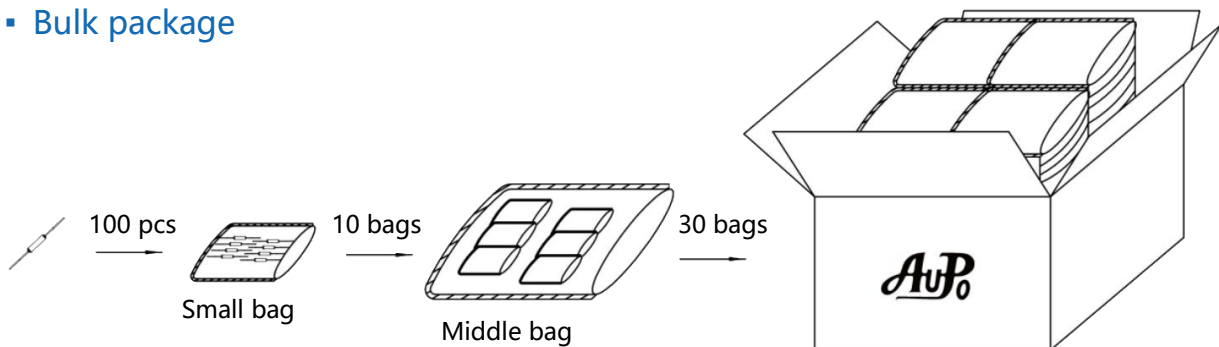


Remark:

1. the printing color and color ring shall be based on the actual product
2. production annual/quarterly code
 - 1) Y for 2011, Z for 2012, and so forth, arranged alphabetically: Y, Z, C, D, E... (excluding A, B, K, P, S, T).
 - 2) 1、2、3、4 for 4 seasons of a year; for example: Y1 for 1st quarter of 2011, Y2 for 2nd quarter of 2011

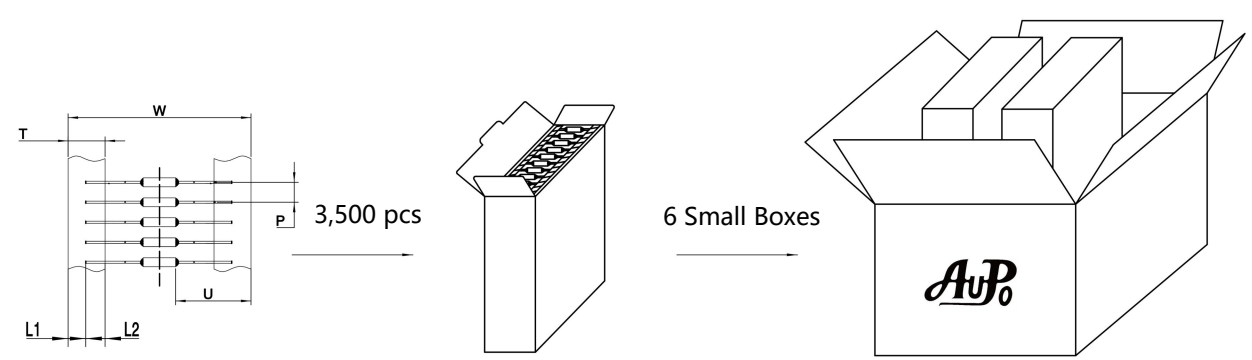
Package

Bulk package



	Small bag	Middle bag	Package carton
Size(mm)	135x85	250x190	Based on actual volume
Volume(pcs)	100	1000	Based on actual volume

- Taping package(1A product for instance)



Unit: mm

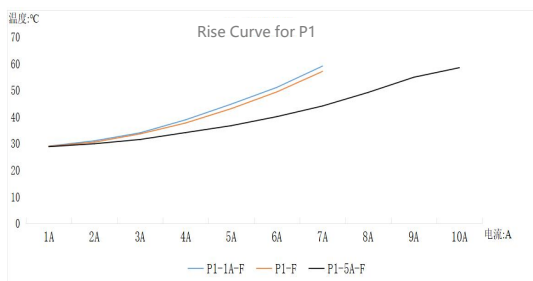
T	W	U	P
6±1	85±1	39.5± 1	5±0.5

Remark: W & U differ as per actual dimension of lead wire

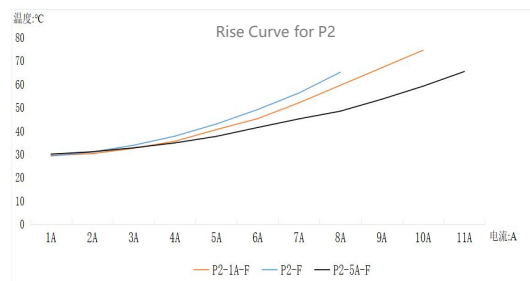
■ Performance test data

■ Temperature rise curve

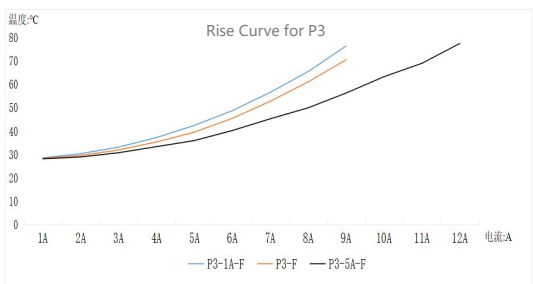
P1-*A-F (102°C)



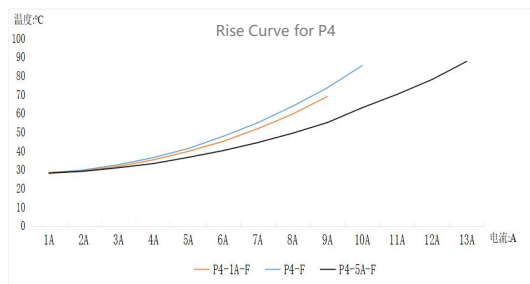
P2-*A-F (115°C)



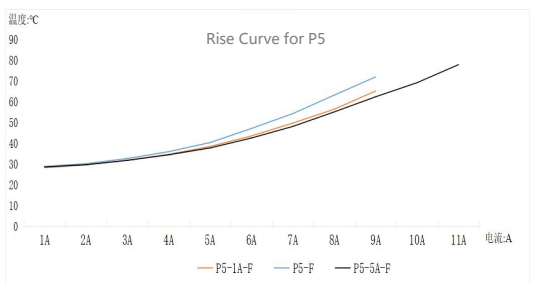
P3-*A-F (125°C)



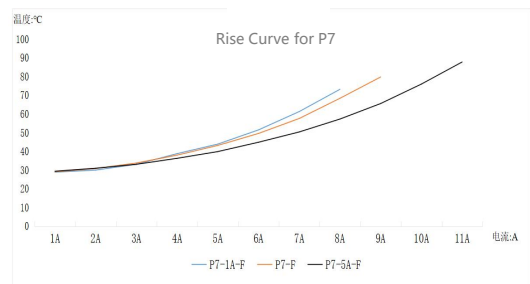
P4-*A-F (130°C)



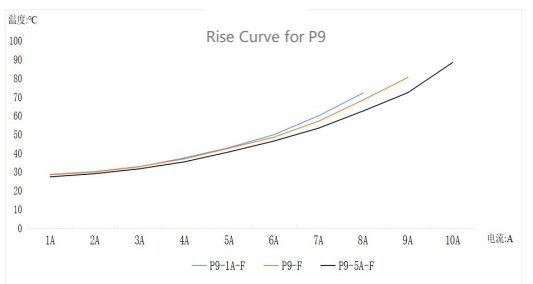
P5-*A-F (135°C)



P7-*A-F (150°C)

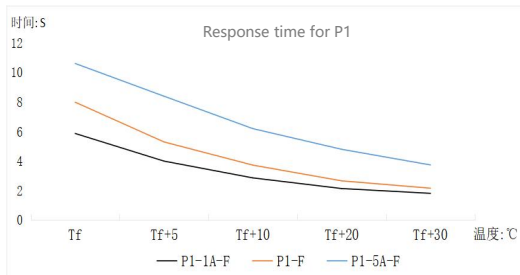


P9-*A-F (138°C)

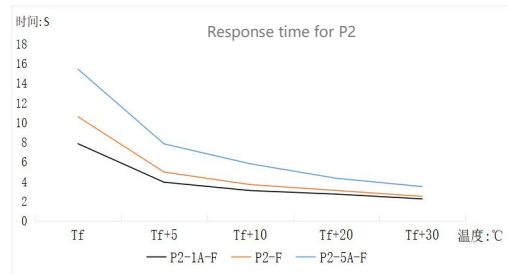


▪ Response time

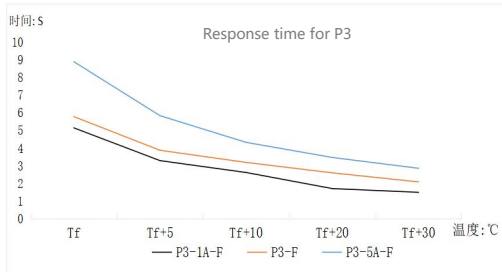
P1-*A-F (102°C)



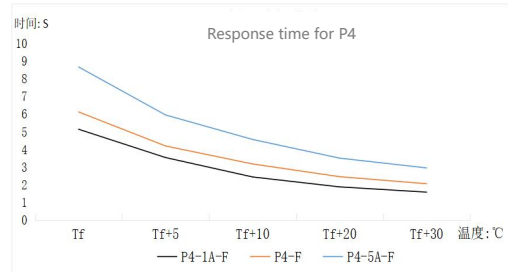
P2-*A-F (115°C)



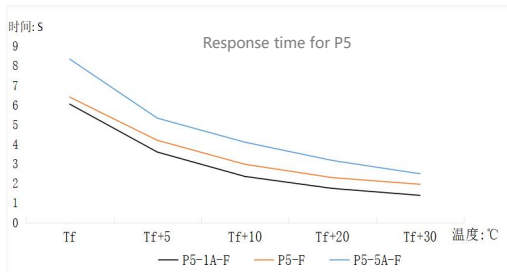
P3-*A-F (125°C)



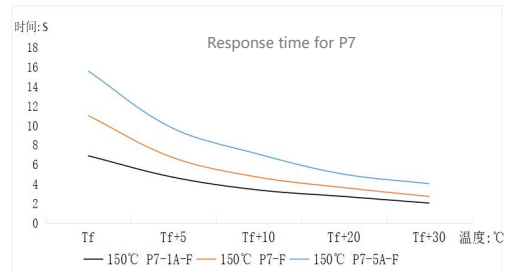
P4-*A-F (130°C)



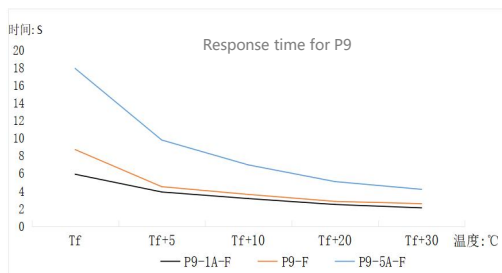
P5-*A-F (135°C)



P7-*A-F (150°C)



P9-*A-F (138°C)



Application of Thermal Cutoff

AUPO thermal cutoff offers a range of standard and custom specifications, delivering reliable one-off overheating protection for various electrical devices. The installation method and location will affect the performance of the thermal cutoff. Given the critical role of operation and installation in determining the overall performance, we provide the following guidelines for design, installation, and transportation/storage to ensure optimal performance.

▪ Design

Thermal cutoff is a type of overheating protection product.

Thermal cutoff is a special product for overheating protection, which is designed for abnormal temperature rise. It cannot be used as a current fuse to cut off the circuit when the current is too high.

Use the thermal cutoff at a voltage and current below the rated values.

Due to the thermal effect of current, the performance of the thermal cutoff will be degraded if the working current is too high. If the device malfunctions, it may prevent safe circuit disconnection. We recommend reserving a margin of 20%-40%.

1) Attention should be paid to ensure that the working temperature of the thermal cutoff does not exceed the holding temperature. It is recommended that the surface temperature of the fuse should not exceed $T_h - 10\text{ }^{\circ}\text{C}$ during long-term working; If exceeded, it may cause deterioration of the temperature sensing alloy, premature or delayed melting of the fuse.

Note: the holding temperature T_h test is a one-time test with rated current applied for up to 168 hours, rather than a cyclic test.

2) When designing, it is necessary to ensure that the overshoot temperature of the equipment does not exceed the maximum limit temperature after the temperature fuse is functioned.

3) If the current passing through the fuse exceeds the rated current or the applied voltage exceeds the rated voltage, due to the current thermal effect, it will not only cause premature melting, but also generate a large number of arcs during melting, which will cause abnormal appearance (bending, damage, deformation of the main body) or deterioration of the insulation layer. Therefore, please use it within the rated voltage or rated current range. When the equipment malfunctions, thermal cutoff working at a state greater than the rated voltage or rated current will result in the inability to safely cut off the circuit. Therefore, users are requested to repeatedly conduct abnormal tests according to different models to confirm whether the circuit can be safely cut off.

- 4) If used in environments with drastic temperature changes (such as outdoors), the fusible alloy will deform, which may cause the thermal cutoff to melt. Therefore, please investigate and confirm the usage environment before use.
- 5) A thermo couple should be installed inside the casing of thermal cutoff to determine the appropriate rated functioning temperature and the correct installation position.
- 6) thermal cutoffs are not recommended for current protection applications.
- 7) As thermal cutoffs are non-resettable, for safety reasons, always replace them with the same model and install them in the same location.

To fully utilize thermal fuses' functionality, conduct repeated tests based on your equipment model to determine the required type.

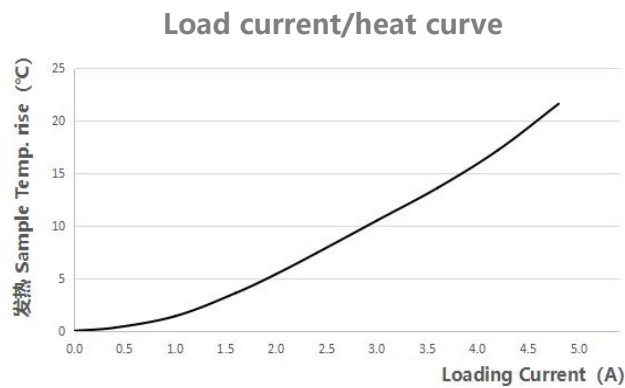
- 1) Users should verify through final product testing that the thermal fuse remains intact under normal operation, only tripping when the equipment malfunctions.
- 2) When installing thermal fuses, ensure they only detect the intended heat source. For heating applications, avoid direct connection to the heating element. Use a non-heating wire to isolate the element, preventing heat transfer through pins that could trigger premature fuse activation. In transformer or motor applications, where temperature must be controlled within the coil, the fuse must maintain efficient thermal conductivity with the coil.

After installing the thermal fuse, avoid violent vibrations or mechanical pressure, as these may cause the fusible alloy and lead wires to fracture, resulting in fuse damage.

When using resin to secure the fuse, select a type that is non-corrosive to both the application area and terminal wires. For resin-based whole-fuse fixation, conduct repeated tests according to your product specifications to ensure the resin's properties (expansion, contraction, and curing temperature) do not affect the fuse's normal operation.

When applying varnish or solvents to machines equipped with thermal fuses for impregnation and drying, ensure the materials used do not corrode or damage the fuse's coating area.

When selecting and installing fuses, account for their self-heating temperature rise under power to prevent reduced lifespan due to improper selection. Refer to the following temperature curve for power-on temperature rise:



Note: This diagram is for illustrative purposes only.

Thermal fuse is not designed for use in the following special environments. Do not use it under these conditions:

- 1) Water, oil, chemical solutions, or organic solvents.
- 2) Direct sunlight, outdoor exposure, or dusty environments.
- 3) Environments prone to condensation that may cause moisture buildup. Additionally, users should verify the fuse's performance and reliability before use in the following environments:
 - 1) Corrosive gases such as sea breeze, chlorine, hydrogen sulfide, nitrogen, sulfides, hydrogen chloride, or sulfur dioxide.
 - 2) Environments with strong static electricity or electromagnetic waves.

▪ Application

▪ Application of A Series

If the fuses are riveted or spliced with various connecting terminal, attention should be paid to the contact resistance of the connection points.

When the connection method of the terminal is not firm, it is easy to cause high resistance values at the connection point. When powering on, these high resistance connection points will generate heat due to the current thermal effect (I^2R). These heat will be conducted along the wire to the inside of the fuse, causing the temperature of the fuse to rise, which may cause the fuse to malfunction or accelerate the aging process of the sealing resin. It is worth noting that when measuring these connection points for the first time, the displayed resistance values may be relatively low. But after several temperature cycles, its resistance value will significantly increase. Based on this, to ensure the stable functioning of the fuse, we recommend using stranded wire instead of single stranded wire. Twisted wires can adhere more tightly during temperature cycling,

maintaining good electrical contact at all times. When the cycling temperature exceeds 150 °C, it is necessary to consider using solder reinforcement.

If the fuse is connected by soldering or immersion soldering, please pay attention to the possible damage caused by the high temperature of the soldering.

Excessive temperature will damage the alloy and epoxy of the fuse, thereby shortening its service life. The welding point should be as far away from the fuse body as possible. At the same time, a thermal tool can be used to clamp the lead wire near the body to effectively dissipate heat (see the figure below). The lower T_f of the fuse, the higher requirement for heat dissipation treatment. It is not recommended to use soldering for fuses with T_f below 113 °C.

Soldering operations should be carried out at lower temperatures and completed within a shorter period of time (not exceeding 2 seconds). To determine the welding process parameters, it is recommended to perform X-ray inspection on the experimental samples before and after soldering to compare whether there is a significant change in the size of the alloy inside the fuse during the soldering process. If the alloy is damaged, it indicates that the current welding parameters and heat dissipation treatment process still need to be optimized.

If secondary welding or repair welding is required, the fuse should be cooled to room temperature before proceeding.

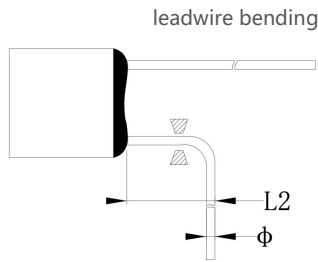


If the fuse is connected by welding or touch welding, it is necessary to avoid the welding current from entering the interior of the thermal fuse.

Wire welding also needs to follow the precautions mentioned in the previous soldering connection section.

When connecting or bending the leads of a fuse, special attention should be paid to supporting the lead parts near both ends of the body.

The connection of the fuse should be at least 3mm away from the body, and the lead wires should be supported during the process to avoid deformation of the shell or damage to the epoxy. It is not advisable to apply a pulling force of more than 1 pound or a pushing force of more than 0.4 pounds on the lead wire. It is also not advisable to bend excessively.



Φ (mm)	< 1.0	1.0~1.6
L2 (mm)	> 3	> 7

After installing the thermal fuse, please avoid stretching, squeezing, bending, or twisting the leads.

▪ Application of P Series

Wire processing

1) When bending or cutting wires, maintain a minimum distance of 3 mm from the fuse's coating area (insulation section) (see Figure 1). Avoid applying pressure to the coating area (insulation section) or the housing.

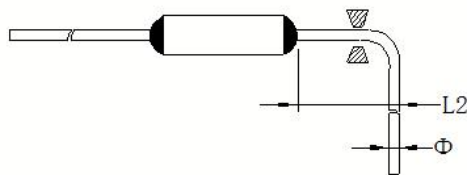


Fig.1 wire

Unit: mm

Φ	< 1.0	1.0~1.6
L2	> 3	> 7

- 2) Do not use tools to scratch the lead wires (terminal wires) or painted areas (insulated sections).
- 3) Avoid applying a pulling force exceeding 1 pound or a pushing force exceeding 0.4 pound to the lead wires. Over-bending is also prohibited.

Soldering

1) The soldering conditions are specified in Table 1 below, with emphasis on maintaining low temperatures and short duration. When operating under non-standard conditions, ensure the fuse remains unaffected by soldering heat. For high-temperature or prolonged soldering operations, it is recommended to secure the leads with pliers while implementing heat dissipation measures.

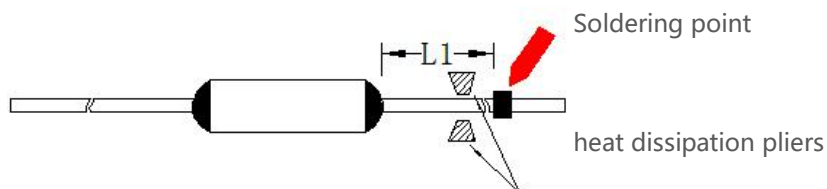


Table 1

Rated Tf	Soldering Height and Maximum Allowable Soldering Time			Soldering temperature
	L1=10mm	L1=20mm	L1=30mm	
< 115°C	1S	2S	3S	400°C
115°C~134°C	2S	3S	4S	
135°C~150°C	3S	4S	5S	
> 150°C	4S	5S	6S	

2) Avoid preheating and gradual cooling whenever possible. If these procedures are necessary, conduct tests to verify their impact on the fuse.

3) Wave soldering recommendations (For customers requiring wave soldering operations, consult our technical team for specific precautions).

4) For secondary soldering or fusion process, ensure the fuse is cooled to room temperature before proceeding.

5) Application products must undergo testing to ensure that no abnormal conditions will cause the temperature around the fuse to exceed the limit temperature (T_m), which may occur in a condition known as "excess heat overshoot." For example, when a hot air blower experiences blockage at the inlet or outlet, causing the temperature to rise to T_m , the fuse will interrupt the circuit. However, an incorrect design may lead to premature circuit interruption, and excessive excess heat overshoot could damage the fuse. Application products must be tested to confirm that under normal temperature fluctuation conditions (such as heater temperature variations caused by the actuation and reset of the thermostat), the temperature around the fuse will not reach T_m during the thermostat's on-off cycles. (See Figure 3)

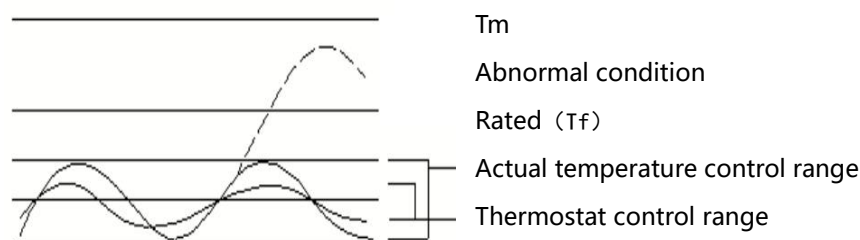


Fig.3

6) Before the fuse cools to ambient temperature after soldering, performing operations like stretching, squeezing, or bending the leads may cause paint peeling or lead detachment. Therefore, avoid these actions.

Connect the leads with sufficient length and flexibility, and secure both the fuse and crimping points to prevent loosening caused by vibrations during normal operation.

When fixing the fuse, avoid excessive pressure on the housing, sealing resin, or pins (e.g., pulling the fuse, over-clamping, or tight bundling), as this may damage the fuse or cause stress concentration on the pins.

For riveting installations, ensure proper contact resistance at the connection points. Improper connections can increase contact resistance, leading to overheating at the junctions. This may damage the sealing resin and other components, potentially causing short circuits or other malfunctions in the device.

▪ Transportation & storage

During transportation and storage, the fuses should be kept away from prolonged exposure to high temperatures.

Fuses rated for temperatures below 80°C may experience thermal stress during transit. In summer, nighttime transportation and thermal insulation are recommended.

Storage conditions: Temperature: 5°C to 35°C; Humidity: 25% RH to 75% RH. Store in a clean, well-ventilated area free from corrosive gases, sulfur-containing gases, and direct sunlight.

■ Explanation of term

- **Rated functioning temperature (T_f, TF)**

As per IEC 60691 standard, thermal fuses must function within the range of $\pm 10^{\circ}\text{C}$ of its rated operating temperature.

- **Functioning temperature (T_f)**

Place the thermal fuse in a constant temperature chamber and set the chamber temperature to 12°C below the fuse's rated temperature ($\text{TF}-12^{\circ}\text{C}$). Gradually increase the temperature at a rate of $0.5-1.0^{\circ}\text{C}$ per minute until the fuse melts, which marks its operating temperature. To ensure accuracy, maintain the fuse's load current below 10mA during measurement.

- **Holding temperature (T_h, TH)**

The maximum temperature that the conductive state can be maintained without changing for 168 hours when rated current is applied to the thermal fuse.

- **Max temperature limit (T_m, TM)**

The maximum temperature at which the thermal fuse can maintain its mechanical and electrical properties without damage at twice the rated voltage for a specified time after changing to open circuit state.

- **Rated current (I_r)**

The maximum current that the thermal fuse is able to carry

- **Rated voltage (U_r)**

The maximum working voltage of the thermal fuse.

- **Thermal fuse**

Also known as thermal links, thermal cutoff, these terms all refer to the same component.

■ Safety standard

Pellet thermal fuse of Aupo received below certifications



■ Statement

Thermal fuses may be compromised by external factors such as pressure, temperature fluctuations, or hazardous environments (e.g., high humidity or sulfur dioxide gas), requiring extra caution during installation. Many consumers lack awareness of these precautions. Manufacturers should explicitly state in user manuals or other materials that users must never install, remove, or replace temperature fuses themselves.

For any inquiries regarding this notice or additional product information, please contact AUPO directly. The parameters presented herein are obtained by our company under specific testing conditions. These parameters are for reference only and do not constitute any commitment.