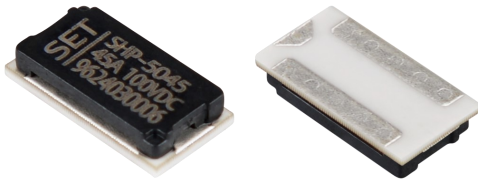


## Description

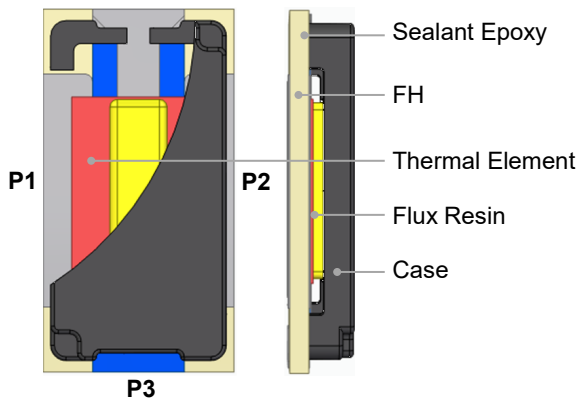
Heat CutOff (HCO) is a three-terminal fuse designed to respond to over-current or over-charge conditions. It consists of several components, including Sealant Epoxy, FH, Fusible Alloy, Flux Resin and Case.

The Heat CutOff (HCO) is primarily utilized in the secondary protection of lithium battery charging and discharging circuits. It acts as an additional protection element in conjunction with the primary protection circuit. During the charging and discharging process of lithium batteries, the Heat CutOff (HCO) is triggered when there is an occurrence of over-current or over-charge, effectively reducing the risk of fire or explosion. When the circuit current surpasses a specific threshold, the fusible alloy within the Heat CutOff (HCO) heats up and fuses, causing the protection circuit to be passively disconnected. Similarly, in cases of primary protection circuit IC or main circuit FET failure during over-charging, the secondary protection IC activates the FET connected to the Heat CutOff (HCO). This, in turn, activates the heating resistor (FH) within the Heat CutOff (HCO), generating heat to actively melt the fusible alloy. This action disconnects the charge and discharge circuit while simultaneously cutting off the Heater circuit. This dual protection mechanism safeguards against both over-current and over-charge situations.

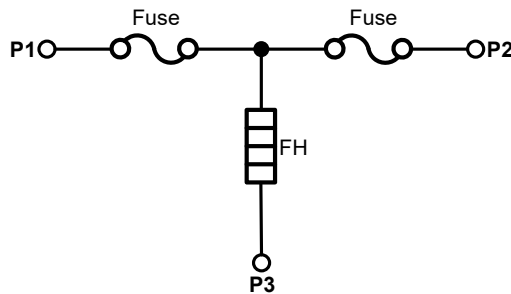
The SETsafe | SETfuse Heat CutOff (HCO) SHP series offers several key features. It has a rated current of (30, 45, 60, 75) A, a rated voltage of 100 VDC, and an operating voltage range from 4.0 to 92.0 VDC. It carries UL, cUL, TUV approvals and is RoHS and REACH compliant.



## Structure Diagrams



## Product Schematic



- P1 ~ P2 Main Circuit (MC)
- P1 / P2 ~ P3 Control Circuit (CC)

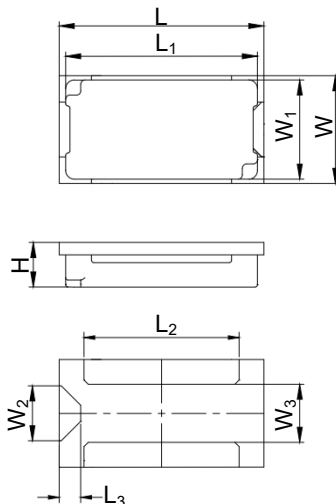
## Application

- Electric Tool
- Storage Battery
- Portable Power Supply
- Electric Motorcycle
- Electric Bicycle
- Household Energy Storage

## Features

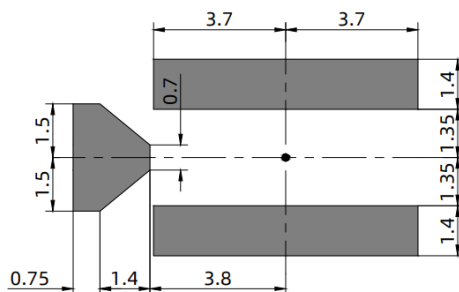
- Surface Mount
- Overcurrent Protection
- Overcharging Protection
- Low Impedance, Low Power Consumption
- Controlled Fusing Time  $\leq 60$  s
- Non-Resettable
- RoHS & REACH Compliant

**Dimensions (Unit: mm)**

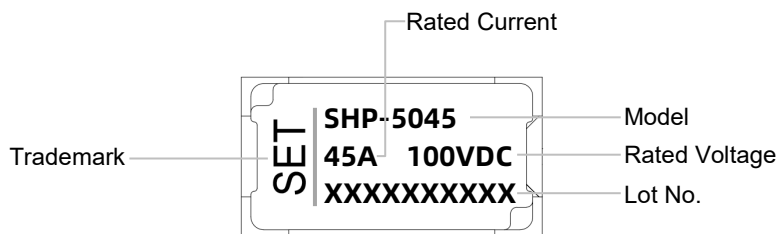


L	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	W	W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	H
9.50 ± 0.30	8.90 ± 0.20	7.20 ± 0.20	1.00 ± 0.20	5.00 ± 0.30	4.60 ± 0.20	2.55 ± 0.20	2.40 ± 0.20	1.90 ± 0.20

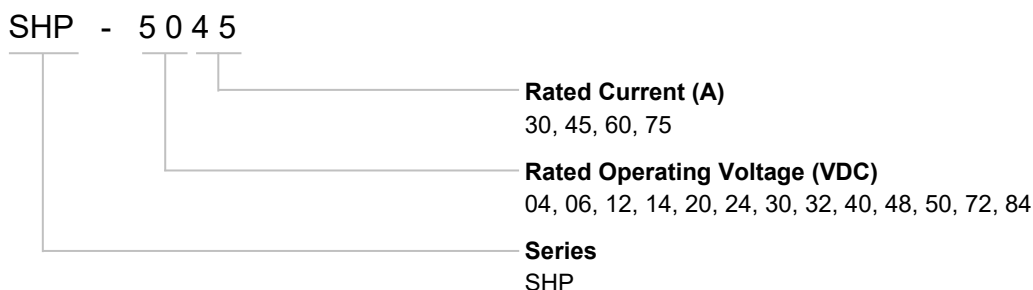
**Recommended Land Pattern**



**Marking**



**Part Number System**



## Specifications

Model	$I_r$	$U_r$	Cells in Series (Selection Reference)	Breaking Capacity	Range of Operating Voltage	Resistance		Agency Information			RoHS REACH
	(A)	DC (V)				(Cells)	(A)	(VDC)	$R_{Fuse}$	$R_{FH}$	
	(A)	DC (V)	(Cells)	(A)	(VDC)	(mΩ)	(Ω)	UL	cUL	TUV	
SHP-0430	30	100	1	80	4.0 ~ 6.6	≤ 2.0	0.35 ~ 0.73	•	•	•	•
SHP-0630	30	100	2	80	5.6 ~ 9.6	≤ 2.0	0.74 ~ 1.43	•	•	•	•
SHP-1230	30	100	3	80	8.4 ~ 13.2	≤ 2.0	1.4 ~ 3.2	•	•	•	•
SHP-1430	30	100	4	80	10.5 ~ 19.1	≤ 2.0	2.9 ~ 5.0	•	•	•	•
SHP-2030	30	100	5	80	14.0 ~ 23.5	≤ 2.0	4.4 ~ 8.9	•	•	•	•
SHP-2430	30	100	6	80	19.8 ~ 27.0	≤ 2.0	5.8 ~ 17.8	•	•	•	•
SHP-3030	30	100	6 ~ 7	80	20.0 ~ 31.5	≤ 2.0	7.9 ~ 18.2	•	•	•	•
SHP-3230	30	100	8	80	26.7 ~ 37.6	≤ 2.0	11.3 ~ 32.4	•	•	•	•
SHP-4030	30	100	8 ~ 10	80	28.0 ~ 47.0	≤ 2.0	17.7 ~ 35.6	•	•	•	•
SHP-4830	30	100	9 ~ 12	80	33.6 ~ 54.0	≤ 2.0	23.3 ~ 51.3	•	•	•	•
SHP-5030	30	100	10 ~ 14	80	35.0 ~ 62.0	≤ 2.0	30.8 ~ 55.7	•	•	•	•
SHP-7230	30	100	12 ~ 17	80	39.6 ~ 72.0	≤ 2.0	41.5 ~ 71.3	•	•	•	•
SHP-8430	30	100	19 ~ 21	80	70.0 ~ 92.0	≤ 2.0	70.5 ~ 222.7	•	•	•	•
SHP-0445	45	100	1	120	4.0 ~ 6.6	≤ 1.6	0.35 ~ 0.73	•	•	•	•
SHP-0645	45	100	2	120	5.6 ~ 9.6	≤ 1.6	0.74 ~ 1.43	•	•	•	•
SHP-1245	45	100	3	120	9.8 ~ 13.5	≤ 1.6	1.4 ~ 4.4	•	•	•	•
SHP-1445	45	100	4	120	13.0 ~ 18.4	≤ 1.6	2.7 ~ 7.7	•	•	•	•
SHP-2045	45	100	5	120	16.7 ~ 23.5	≤ 1.6	4.4 ~ 12.7	•	•	•	•
SHP-2445	45	100	6	120	19.8 ~ 27.0	≤ 1.6	5.8 ~ 17.8	•	•	•	•
SHP-3045	45	100	6 ~ 7	120	22.3 ~ 31.5	≤ 1.6	7.9 ~ 22.6	•	•	•	•
SHP-3245	45	100	8	120	26.7 ~ 37.6	≤ 1.6	11.3 ~ 32.4	•	•	•	•
SHP-4045	45	100	8 ~ 10	120	27.6 ~ 47.0	≤ 1.6	17.7 ~ 34.6	•	•	•	•
SHP-4845	45	100	9 ~ 12	120	33.6 ~ 54.0	≤ 1.6	23.3 ~ 51.3	•	•	•	•
SHP-5045	45	100	10 ~ 14	120	35.0 ~ 62.9	≤ 1.6	31.6 ~ 55.7	•	•	•	•
SHP-7245	45	100	14 ~ 18	120	50.0 ~ 76.5	≤ 1.6	46.8 ~ 113.6	•	•	•	•
SHP-8445	45	100	19 ~ 21	120	70.0 ~ 92.0	≤ 1.6	70.5 ~ 222.7	•	•	•	•

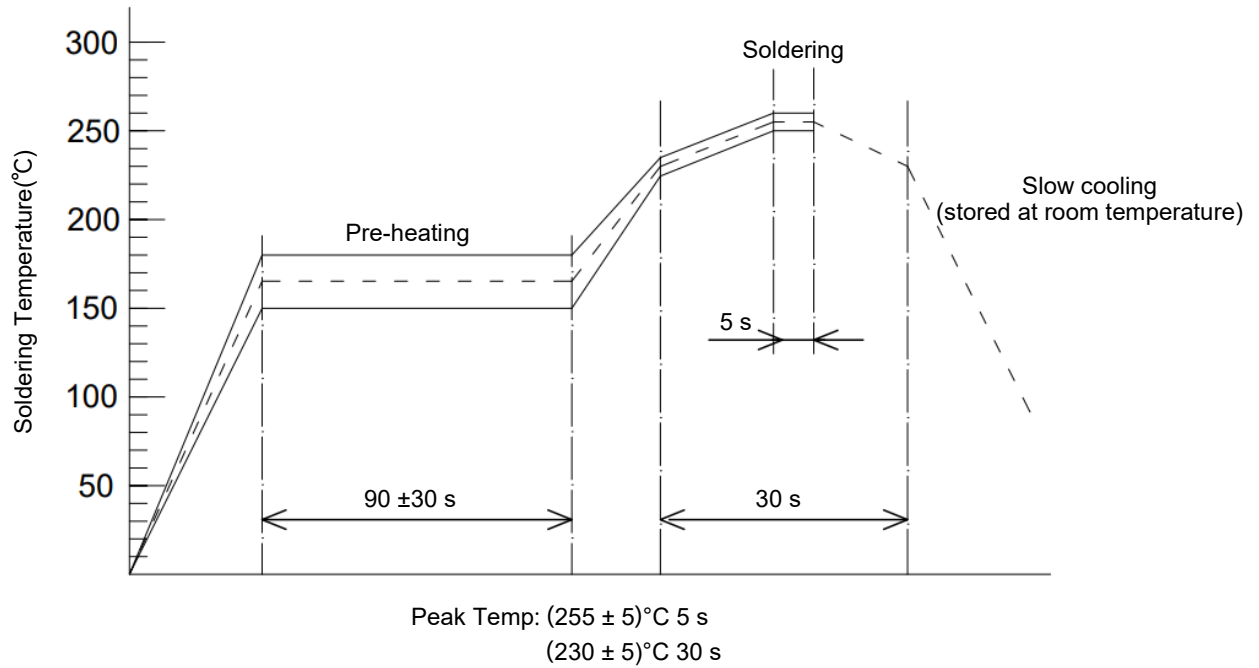
Model	$I_r$	$U_r$	Cells in Series (Selection Reference)	Breaking Capacity	Range of Operating Voltage	Resistance		Agency Information			RoHS REACH
	(A)	DC (V)				(Cells)	(A)	(VDC)	R <sub>Fuse</sub>	R <sub>FH</sub>	
SHP-0460	60	100	1	180	4.0 ~ 6.6	≤ 1.2	0.35 ~ 0.57	•	•	•	•
SHP-0660	60	100	2	180	5.6 ~ 9.6	≤ 1.2	0.74 ~ 1.12	•	•	•	•
SHP-1260	60	100	3	180	9.8 ~ 13.5	≤ 1.2	1.4 ~ 3.4	•	•	•	•
SHP-1460	60	100	4	180	13.0 ~ 18.4	≤ 1.2	2.7 ~ 6.0	•	•	•	•
SHP-2060	60	100	5	180	16.7 ~ 23.5	≤ 1.2	4.4 ~ 10.0	•	•	•	•
SHP-2460	60	100	6	180	19.8 ~ 27.0	≤ 1.2	5.8 ~ 14.0	•	•	•	•
SHP-3060	60	100	6 ~ 7	180	22.3 ~ 31.5	≤ 1.2	7.9 ~ 17.8	•	•	•	•
SHP-3260	60	100	8	180	26.7 ~ 37.6	≤ 1.2	11.3 ~ 25.5	•	•	•	•
SHP-4060	60	100	8 ~ 10	180	27.6 ~ 47.0	≤ 1.2	17.7 ~ 27.2	•	•	•	•
SHP-4860	60	100	9 ~ 12	180	33.6 ~ 54.0	≤ 1.2	23.3 ~ 40.3	•	•	•	•
SHP-5060	60	100	12 ~ 14	180	43.7 ~ 62.9	≤ 1.2	31.7 ~ 68.2	•	•	•	•
SHP-7260	60	100	14 ~ 18	180	50.0 ~ 76.5	≤ 1.2	46.8 ~ 89.3	•	•	•	•
SHP-8460	60	100	19 ~ 21	180	70.0 ~ 92.0	≤ 1.2	70.5 ~ 175.0	•	•	•	•
SHP-0475	75	100	1	200	4.0 ~ 6.6	≤ 0.9	0.35 ~ 0.57	•	•	•	•
SHP-0675	75	100	2	200	5.6 ~ 9.6	≤ 0.9	0.74 ~ 1.12	•	•	•	•
SHP-1275	75	100	3	200	9.8 ~ 13.5	≤ 0.9	1.4 ~ 3.4	•	•	•	•
SHP-1475	75	100	4	200	13.0 ~ 18.4	≤ 0.9	2.7 ~ 6.0	•	•	•	•
SHP-2075	75	100	5	200	16.7 ~ 23.5	≤ 0.9	4.4 ~ 10.0	•	•	•	•
SHP-2475	75	100	6	200	19.8 ~ 27.0	≤ 0.9	5.8 ~ 14.0	•	•	•	•
SHP-3075	75	100	6 ~ 7	200	22.3 ~ 31.5	≤ 0.9	7.9 ~ 17.8	•	•	•	•
SHP-3275	75	100	8	200	26.7 ~ 37.6	≤ 0.9	11.3 ~ 25.5	•	•	•	•
SHP-4075	75	100	8 ~ 10	200	27.6 ~ 47.0	≤ 0.9	17.7 ~ 27.2	•	•	•	•
SHP-4875	75	100	9 ~ 12	200	33.6 ~ 54.0	≤ 0.9	23.3 ~ 40.3	•	•	•	•
SHP-5075	75	100	12 ~ 14	200	43.7 ~ 62.9	≤ 0.9	31.7 ~ 68.2	•	•	•	•
SHP-7275	75	100	14 ~ 18	200	50.0 ~ 76.5	≤ 0.9	46.8 ~ 89.3	•	•	•	•
SHP-8475	75	100	19 ~ 21	200	70.0 ~ 92.0	≤ 0.9	70.5 ~ 175.0	•	•	•	•
Current Carrying Capacity	100% x $I_r$ , no melting										
Current Fusing Time	200% x $I_r$ , the fusing time is < 1 min										
Controlled Fusing Time	In operation voltage range, the fusing time is <1min										
Endurance Test	500% x $I_r$ , power on 5 ms, power off 995 ms, 100,000 cycles										

Note:

1. For P1 - P2, please refer to the structure diagram;
2. “•” Means certificated, “○” Means non-certificated ;
3. RoHS & REACH Comply.

## Soldering Parameters

### 1. Reflow Soldering Method (For Reference Only)



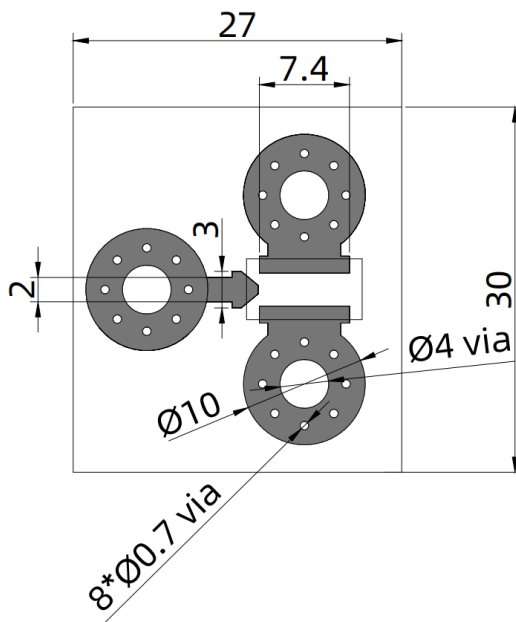
### 2. Recommended Hand Soldering Parameters

Solder Iron Temp:  $(300 \pm 5)^{\circ}\text{C}$

Soldering Time:  $\leq 3$  s

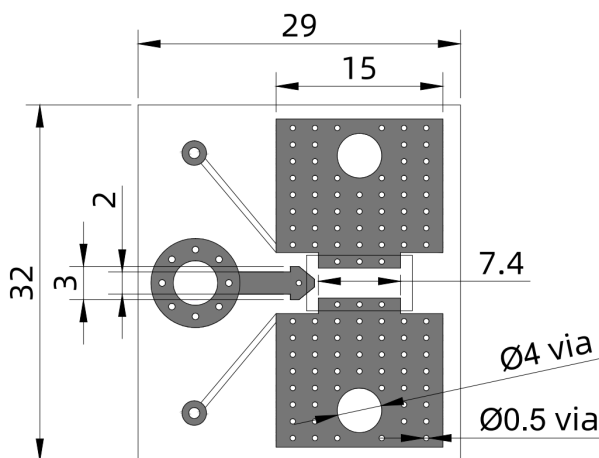
### Recommended Temperature Rise Test PCB Board

1. For rated currents ≤ 50 A



Materials	Base Thickness	Copper Width	Copper Thickness	Number Of board layers	Screw Specifications
FR-4	1.4 mm	7.4 mm	2.0OZ	Double Sided Board	M4

2. For rated currents > 50 A

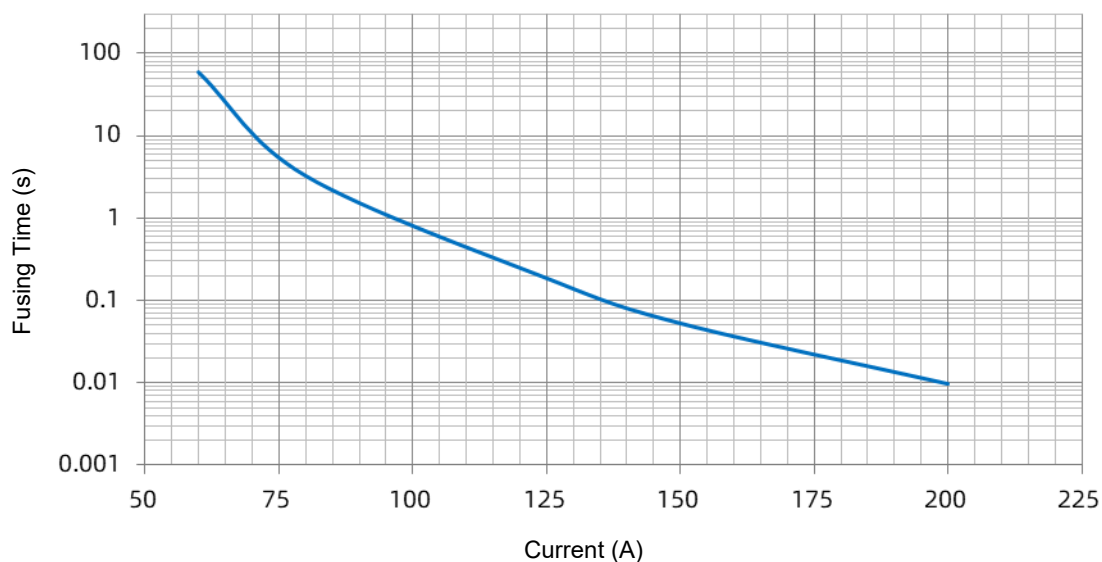


Materials	Base Thickness	Copper Width	Copper Thickness	Number Of board layers	Screw Specifications
FR-4	1.4 mm	15 mm	2.0OZ	Double Sided Board	M4

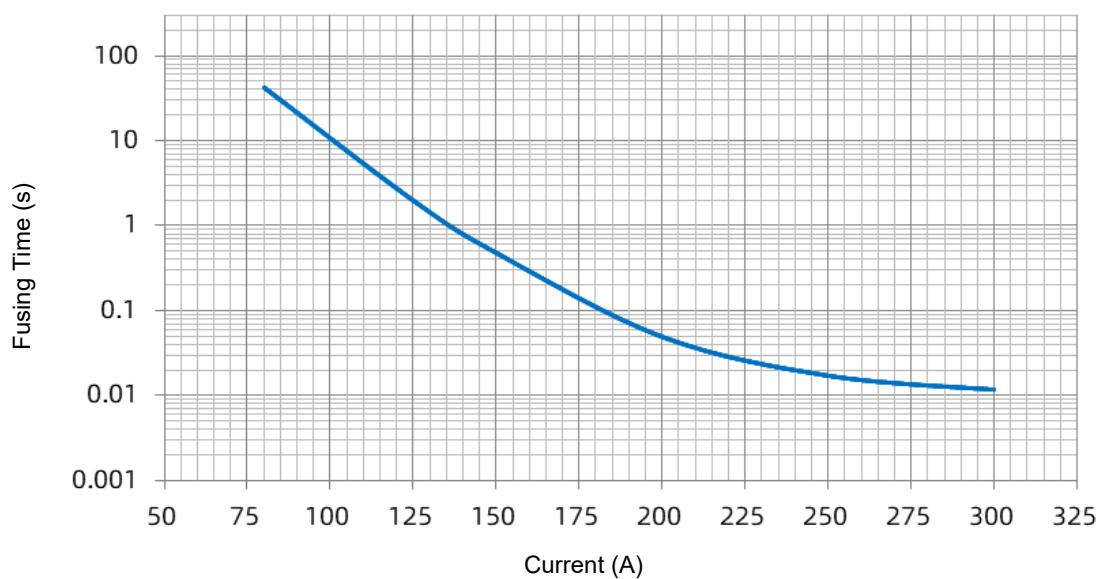
## Current-Time Curve (Reference)

The Current-Time curve shows functioning time at multi-times rated current at room temperature.

**SHP 30 A Current-Time Curve**



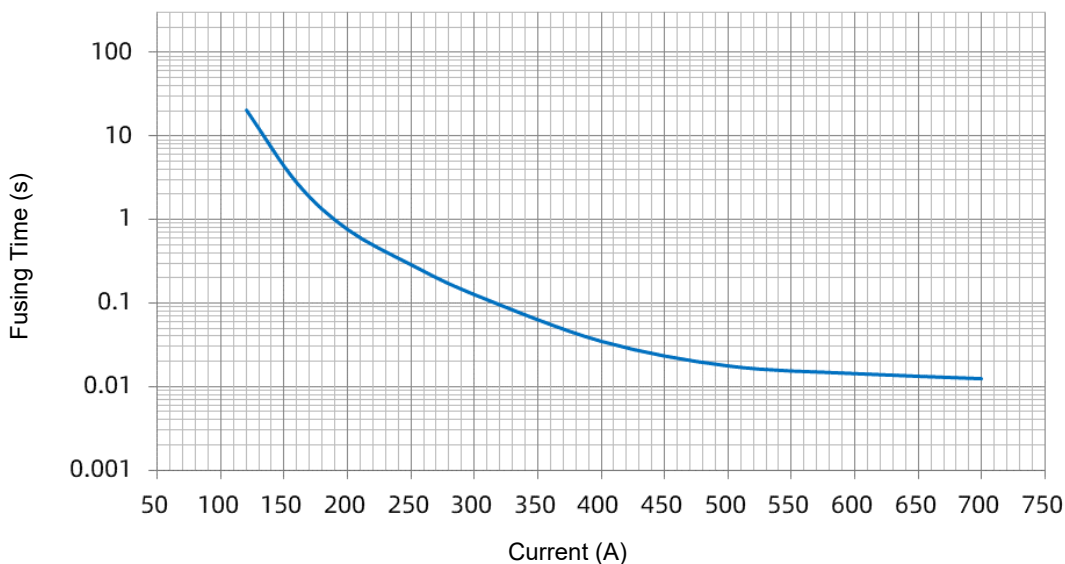
**SHP 45 A Current-Time Curve**



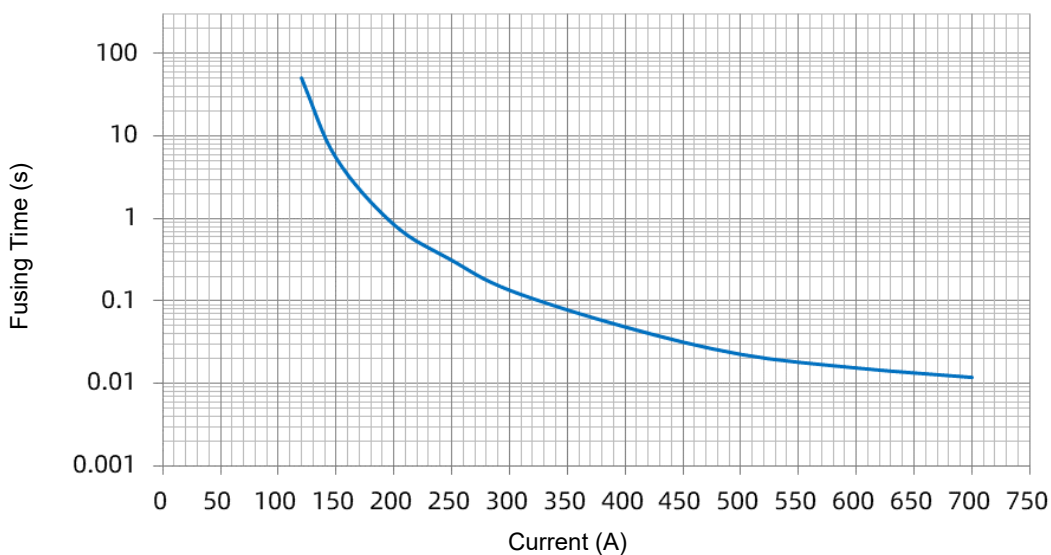
## Current-Time Curve (Reference)

The Current-Time curve shows functioning time at multi-times rated current at room temperature.

**SHP 60 A Current-Time Curve**



**SHP 75 A Current-Time Curve**

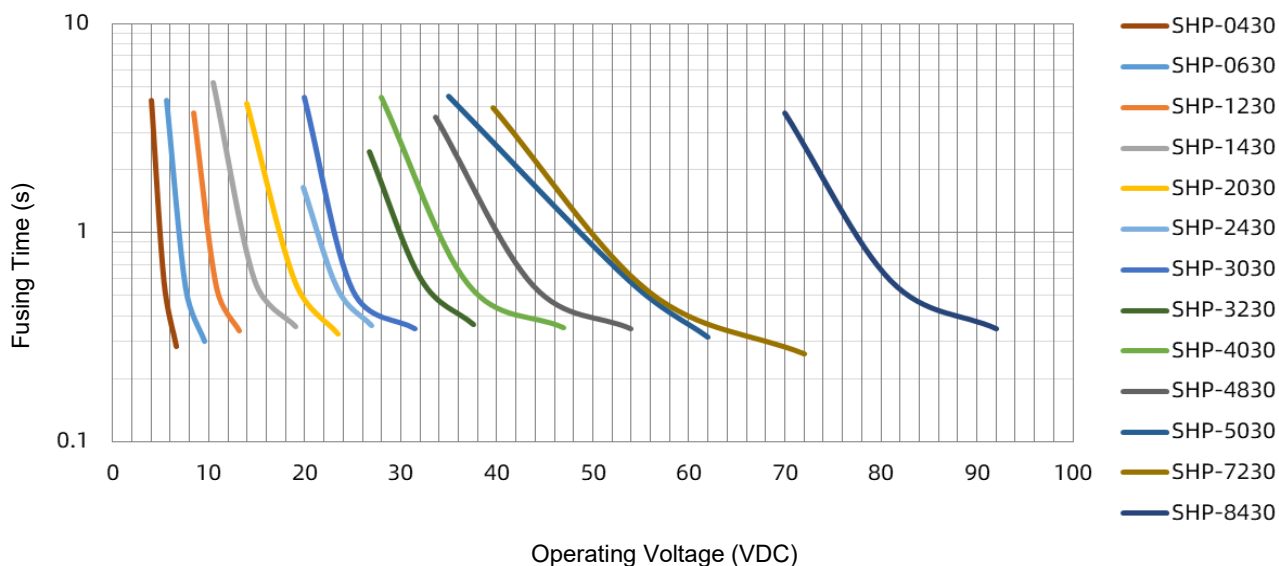




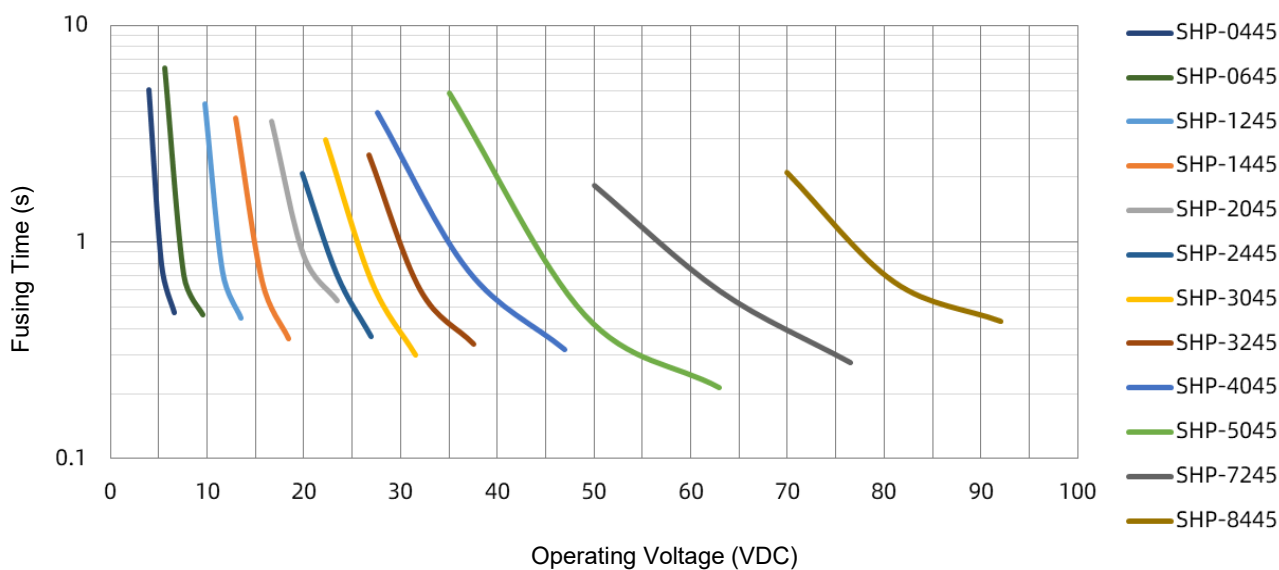
### Controlled Fusing Time Curve (Reference)

The FH applies the operating voltage at room temperature, and collects the disconnection time of P1-P2.

**SHP 30 A Controlled Fusing Time Curve**



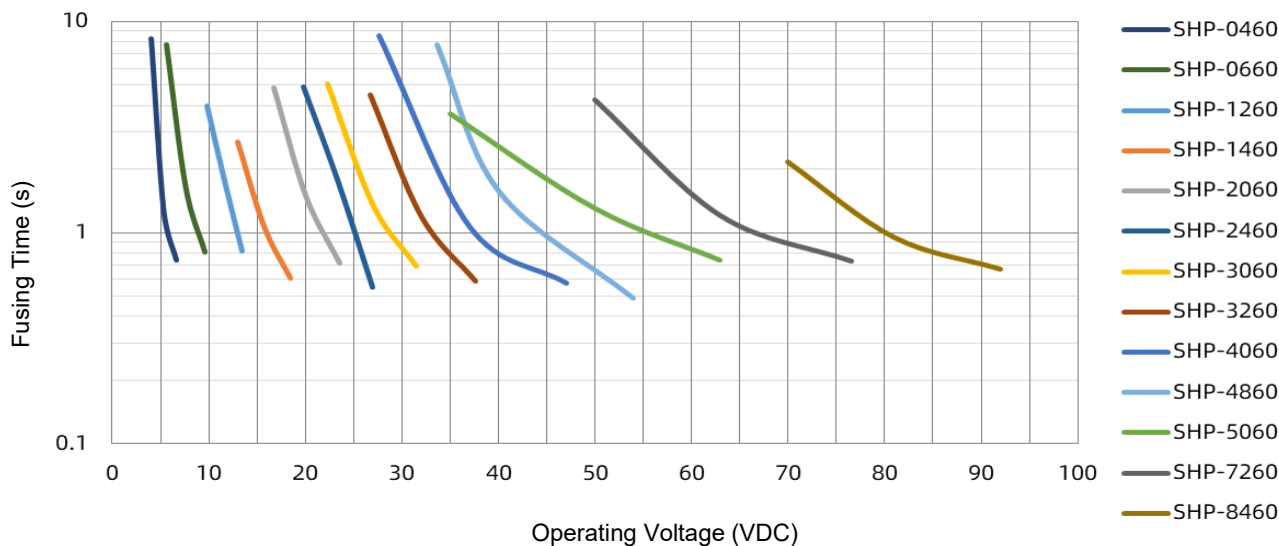
**SHP 45 A Controlled Fusing Time Curve**



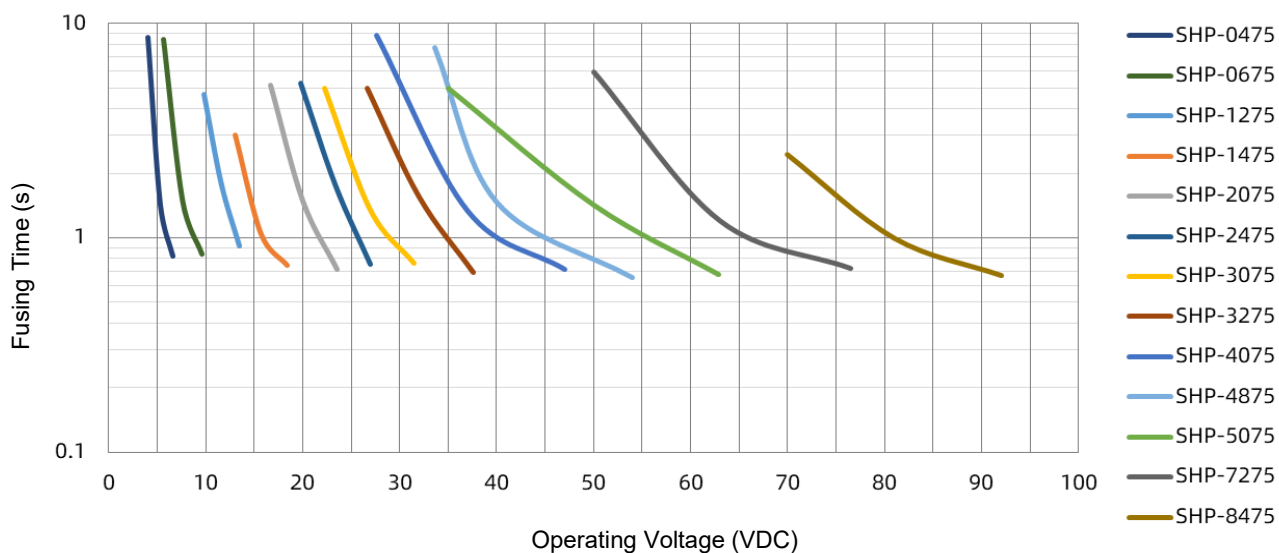
### Controlled Fusing Time Curve (Reference)

The FH applies the operating voltage at room temperature, and collects the disconnection time of P1-P2.

**SHP 60 A Controlled Fusing Time Curve**



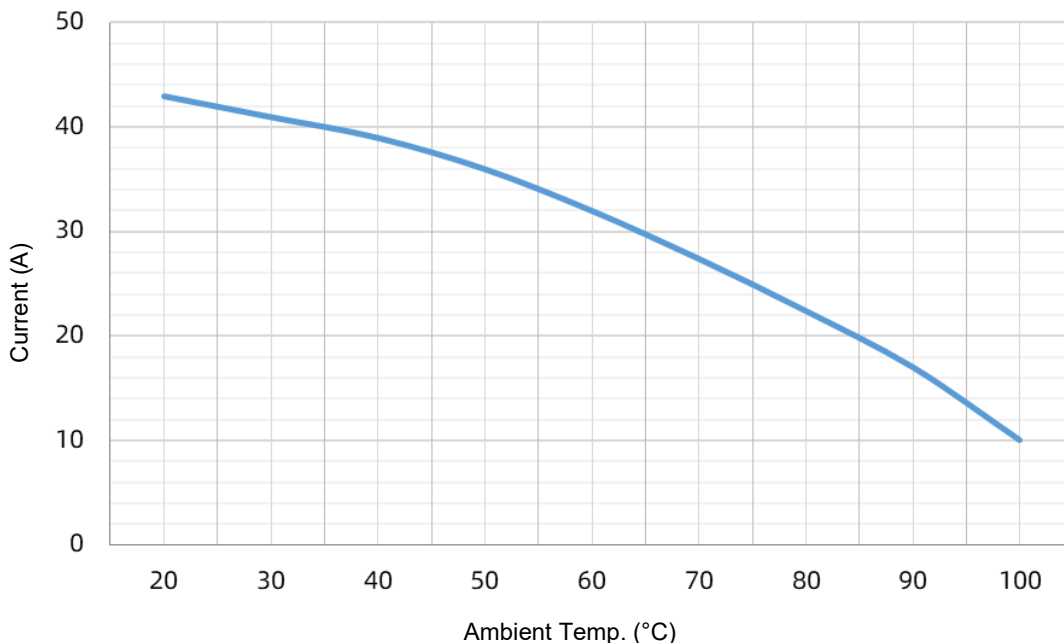
**SHP 75 A Controlled Fusing Time Curve**



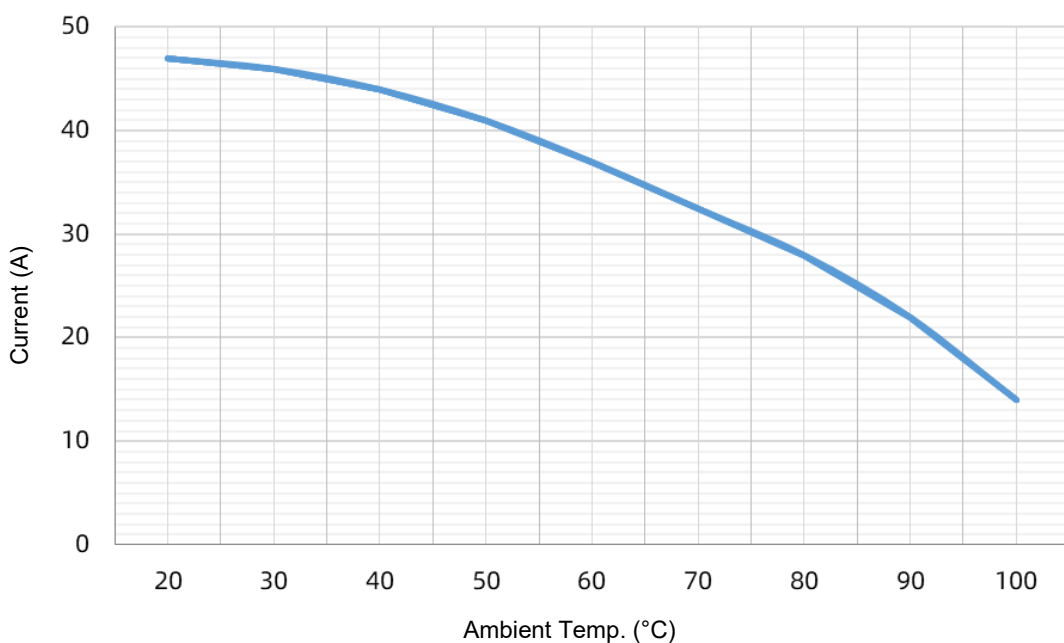
### Current Carrying Capacity (Reference)

Under different temperatures apply test current, the surface temperature is 100 °C as the highest point, and the load value is obtained.

**SHP 30 A Current Carrying Capacity**



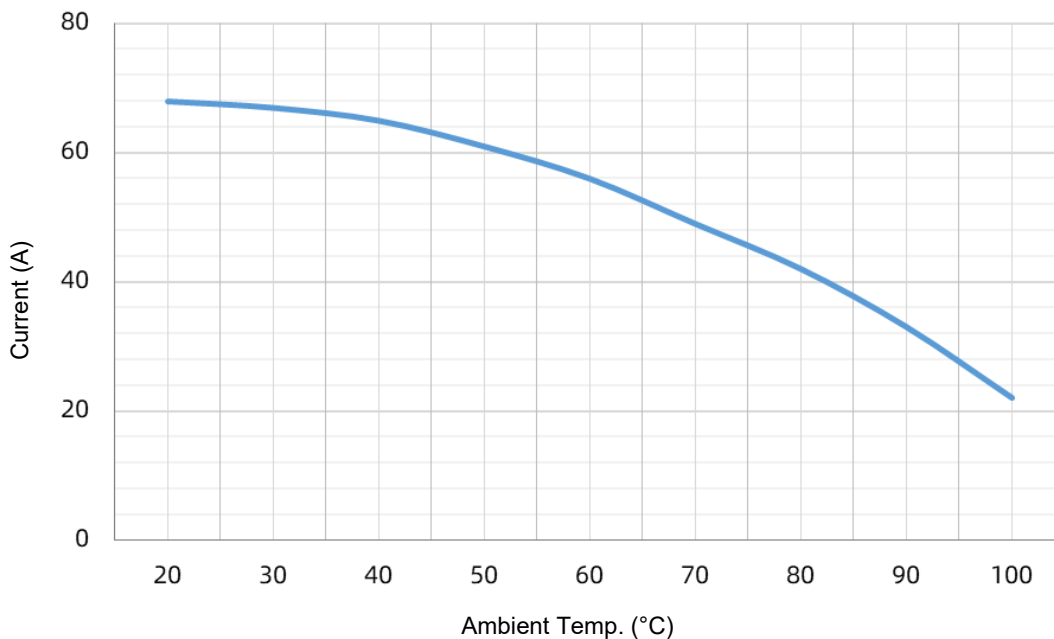
**SHP 45 A Current Carrying Capacity**



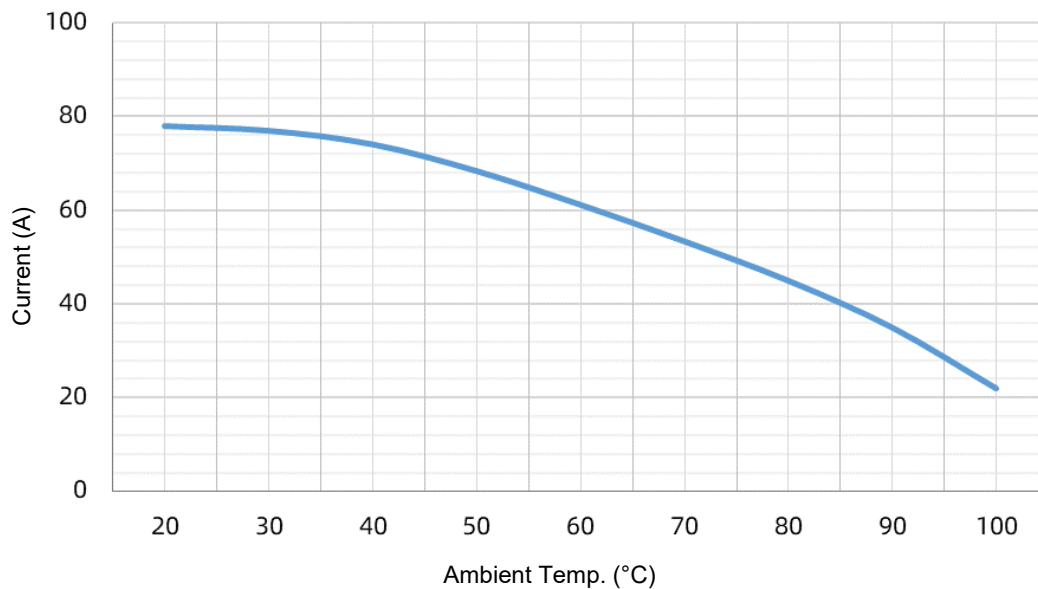
## Current Carrying Capacity (Reference)

Under different temperatures apply test current, the surface temperature is 100 °C as the highest point, and the load value is obtained.

**SHP 60 A Current Carrying Capacity**



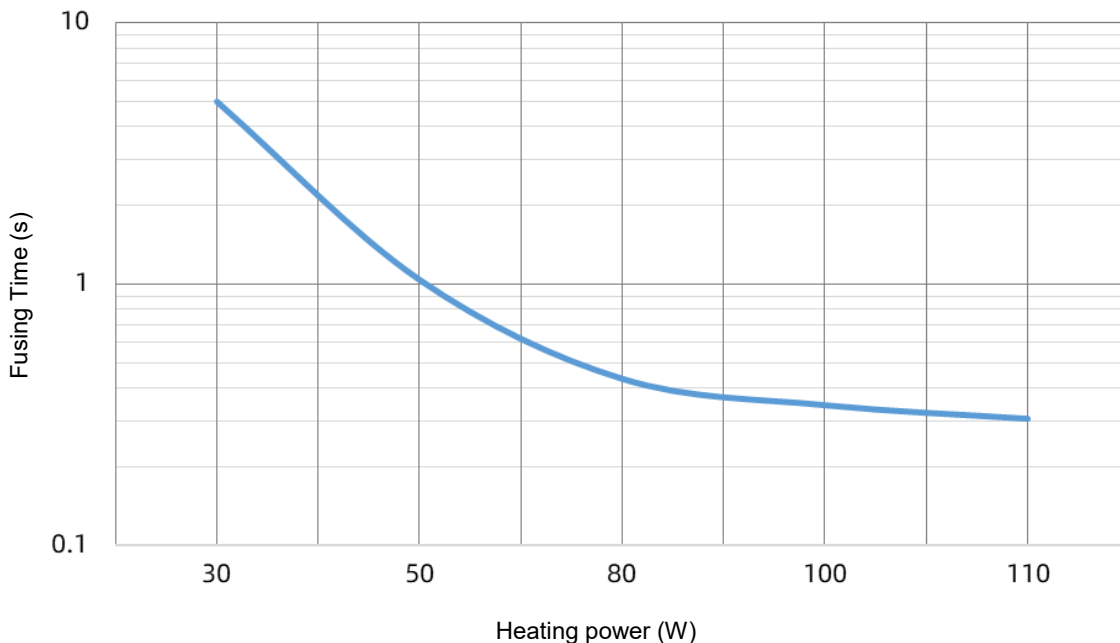
**SHP 75 A Current Carrying Capacity**



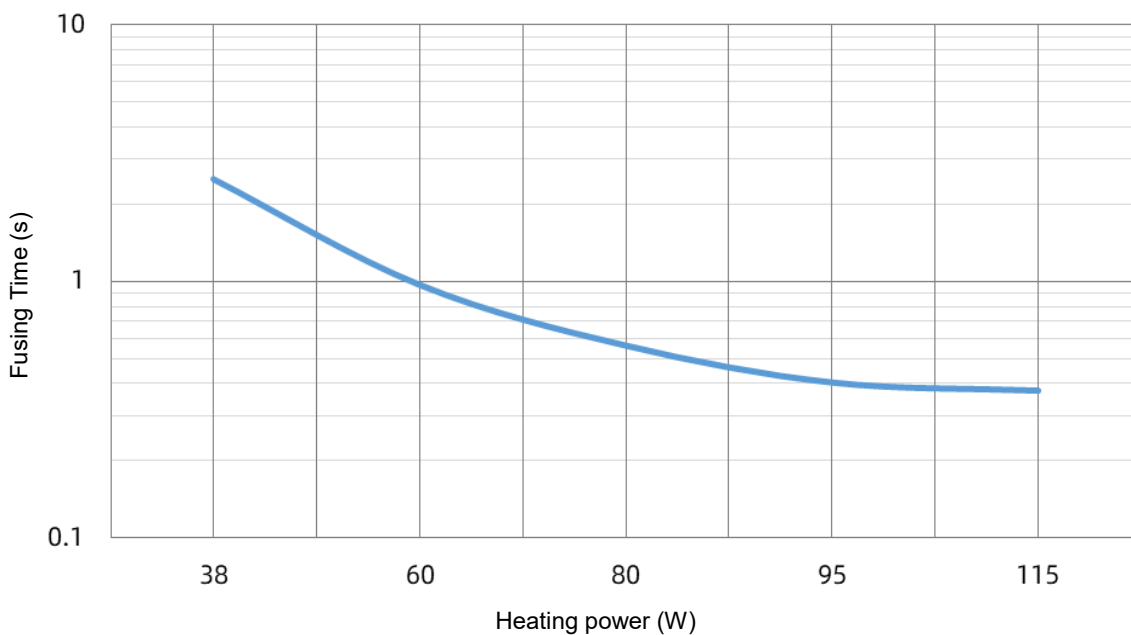
## Power-Time Curve (Reference)

At room temperature, apply the operating voltage within the power range of the heating element, and collect the disconnection time of P1 - P2.

**SHP 30 A Power-Time Curve**



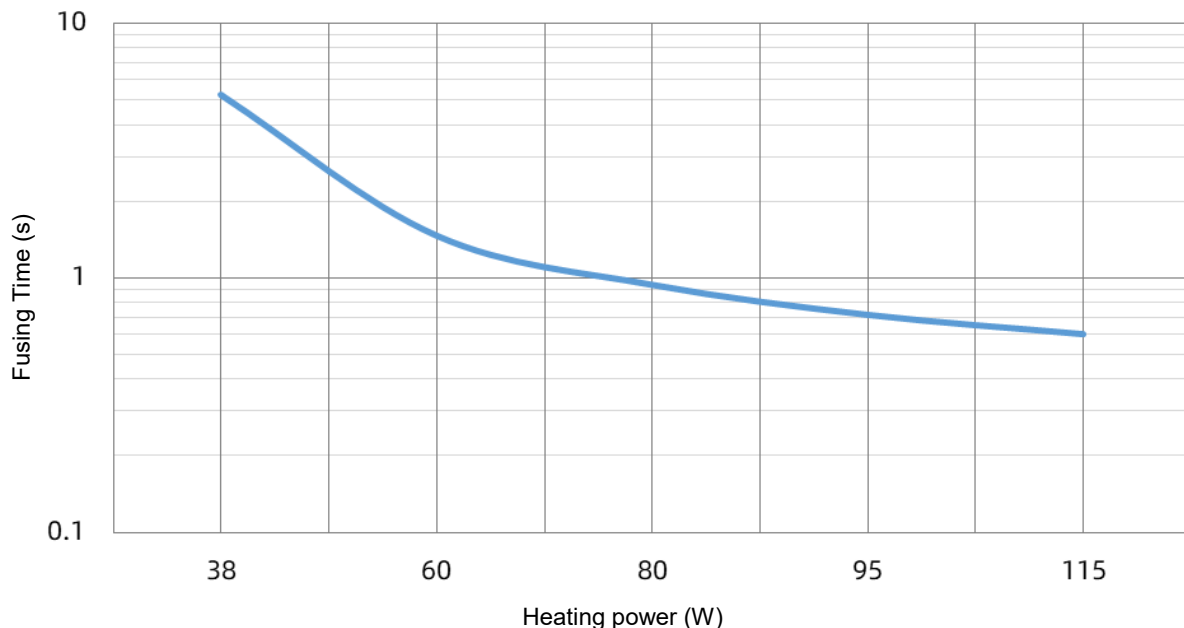
**SHP 45 A Power-Time Curve**



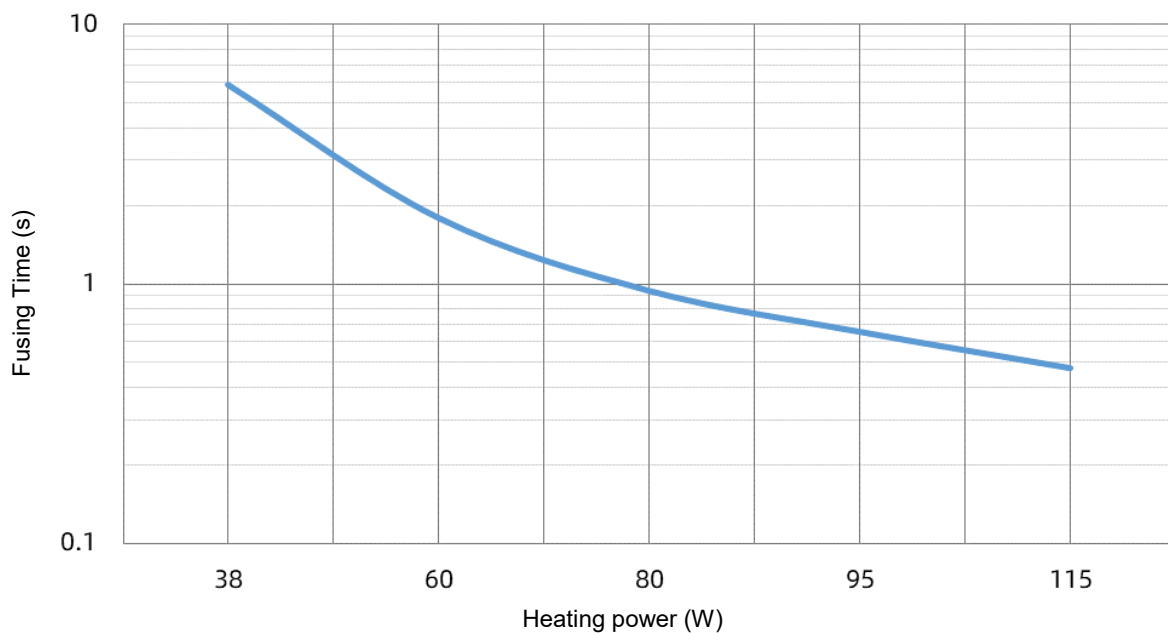
### Power-Time Curve (Reference)

At room temperature, apply the operating voltage within the power range of the heating element, and collect the disconnection time of P1-P2.

**SHP 60 A Power-Time Curve**



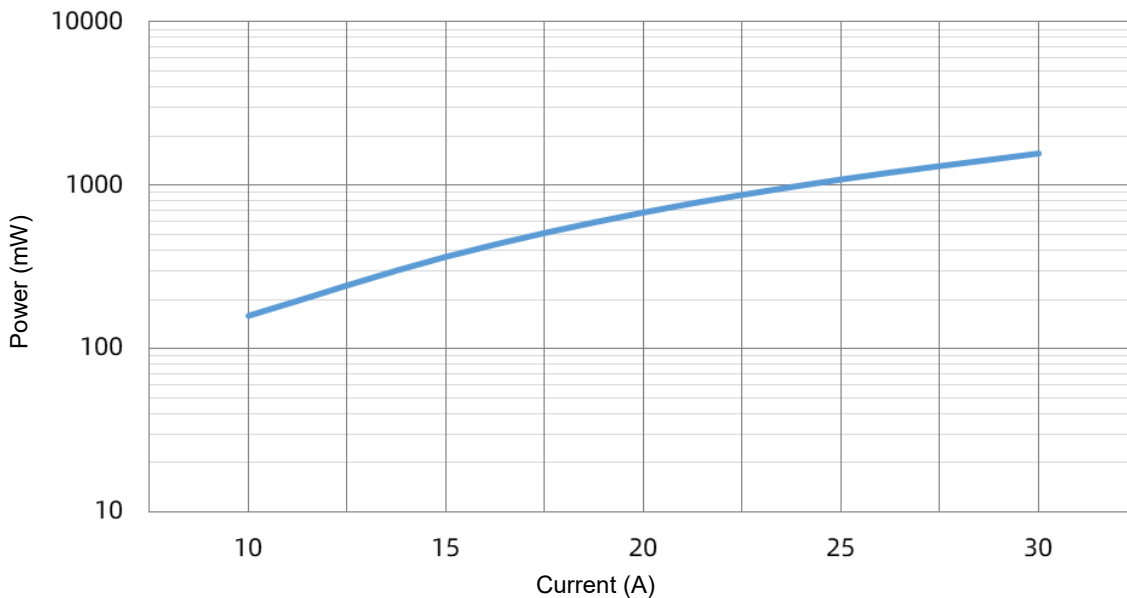
**SHP 75 A Power-Time Curve**



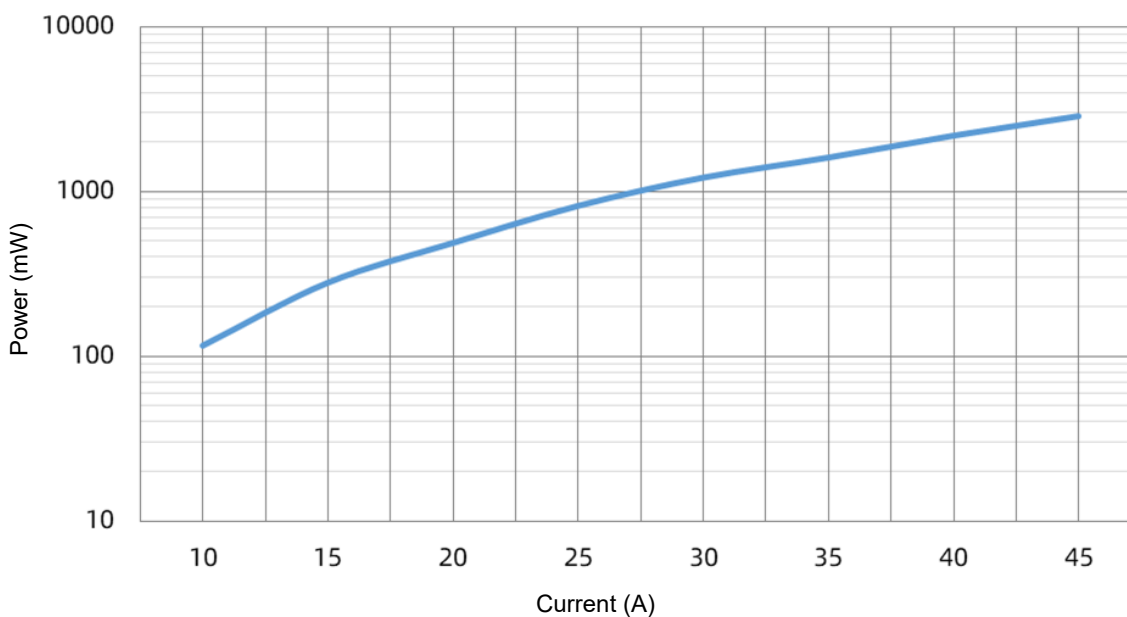
### Current-power curve (Reference)

At room temperature, P1 - P2 is connected to test current, and the voltage drop of P1 - P2 is collected to obtain the product power consumption.

**SHP 30 A Current-power curve**



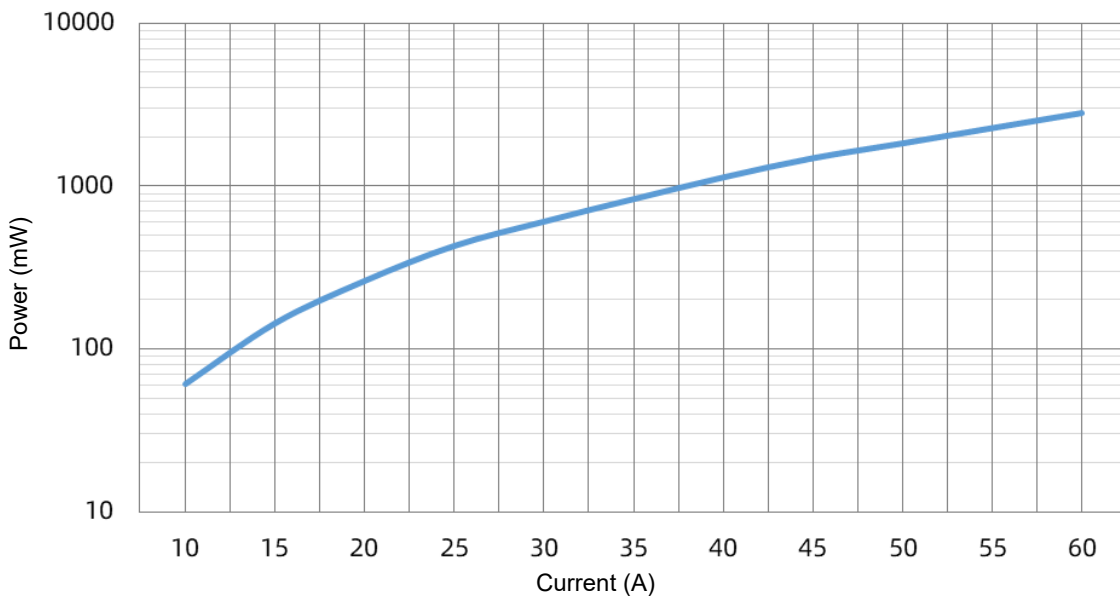
**SHP 45 A Current-power curve**



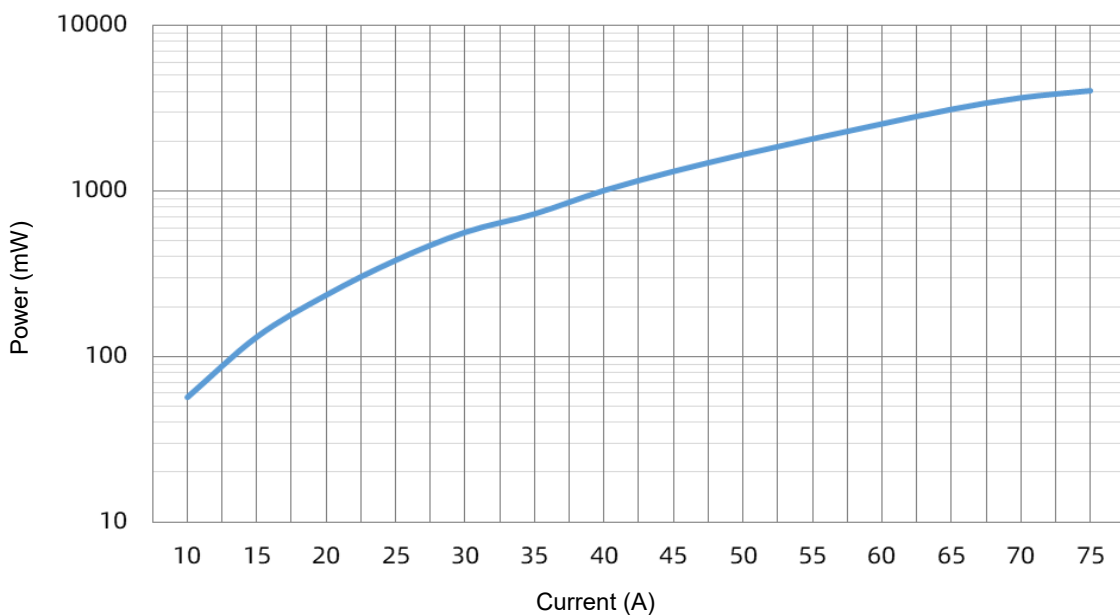
### Current-power curve (Reference)

At room temperature, P1-P2 is connected to test current, and the voltage drop of P1- P2 is collected to obtain the product power consumption.

**SHP 45 A Current-power curve**



**SHP 75 A Current-power curve**

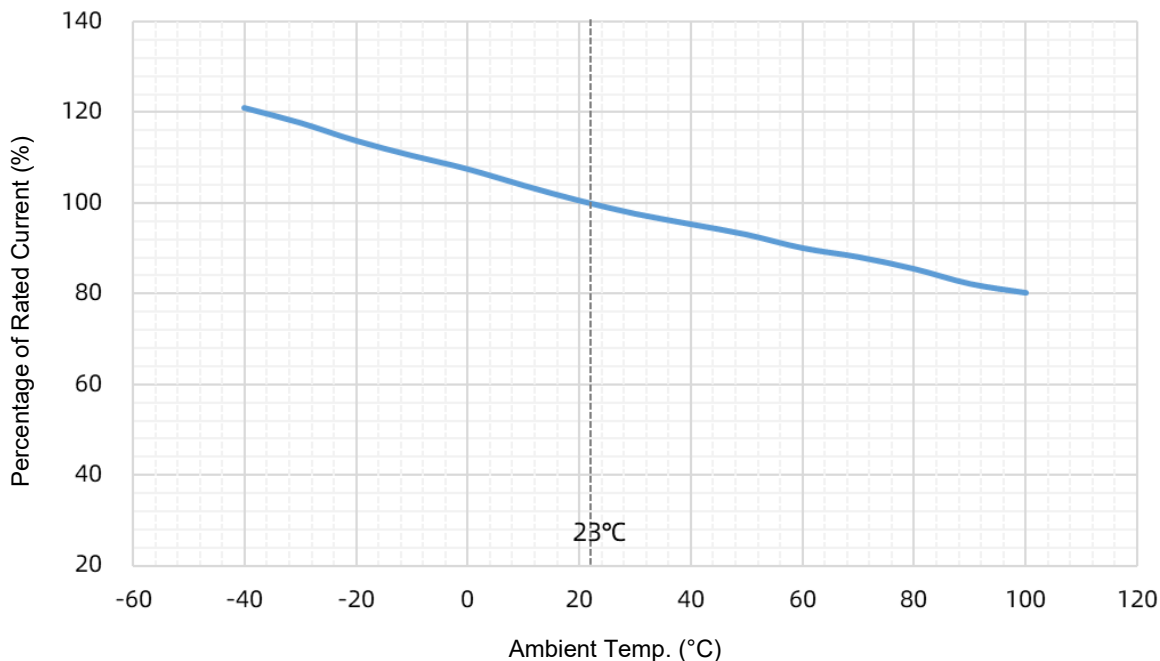




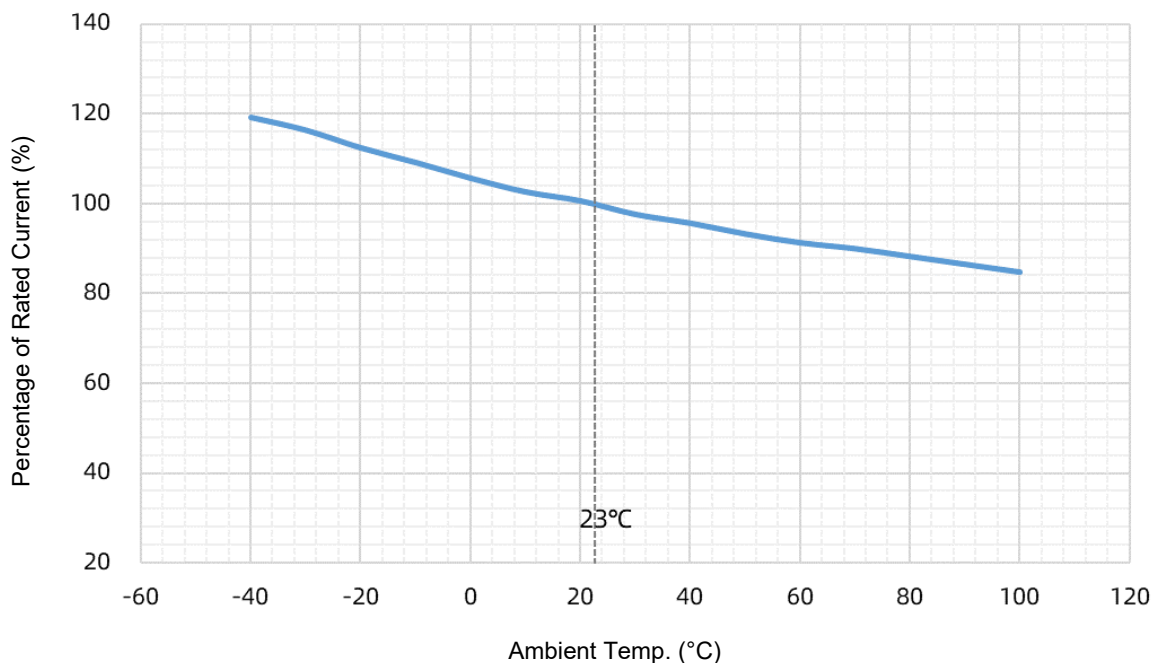
### Rated Current Derating Curve (Reference)

At different temperatures, P1 - P2 is connected to the test current, and the power consumption is based on 100 % rated current at 23 °C. The test current is adjusted to obtain the percentage of rated current.

**SHP 30 A Rated Current Derating Curve**



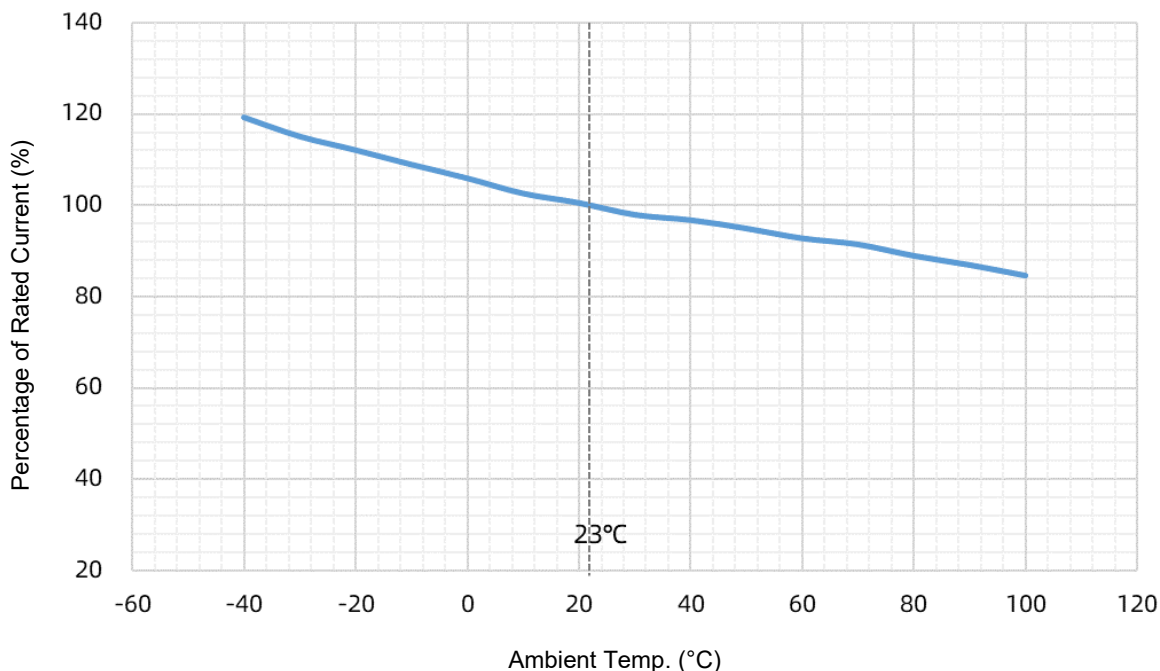
**SHP 45 A Rated Current Derating Curve**



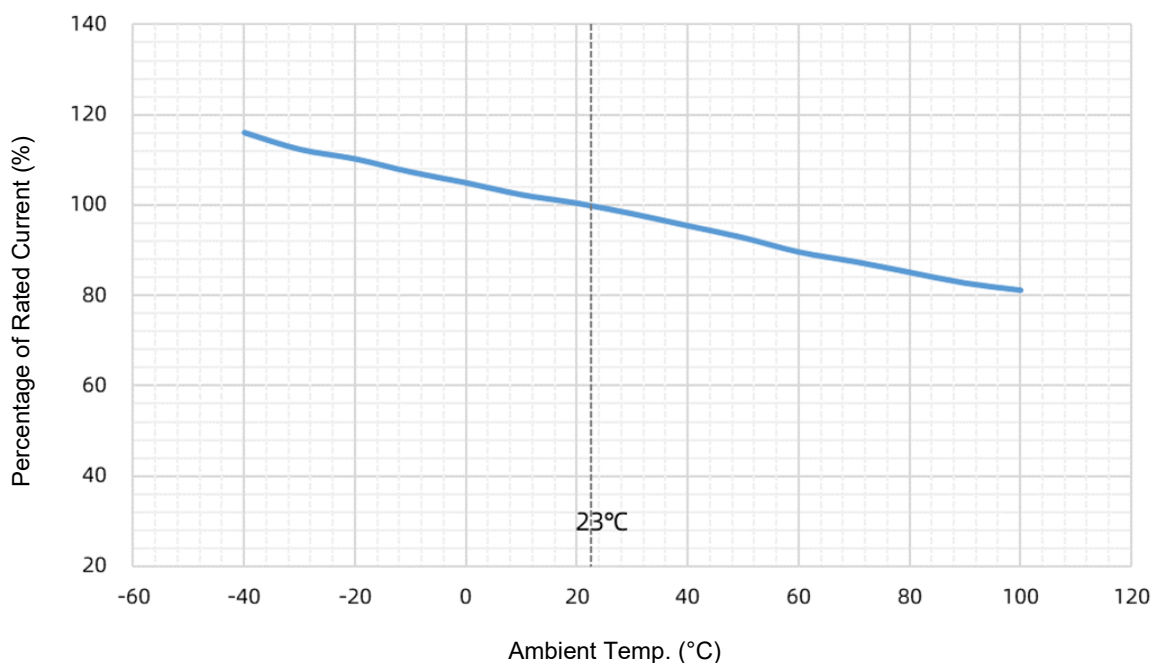
### Rated Current Derating Curve (Reference)

At different temperatures, P1 - P2 is connected to the test current, and the power consumption is based on 100 % rated current at 23 °C. The test current is adjusted to obtain the percentage of rated current.

**SHP 60 A Rated Current Derating Curve**

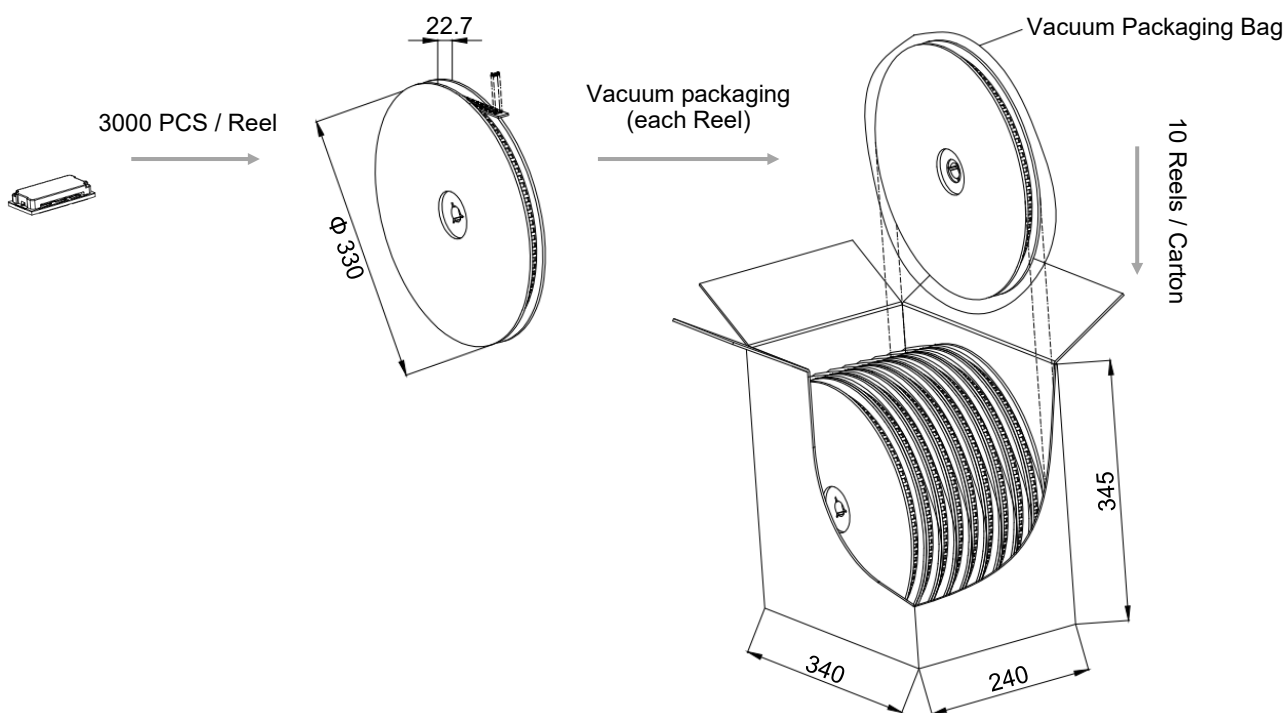


**SHP 75 A Rated Current Derating Curve**



### Packaging Information

Item	Reel	Carton
Dimensions (mm)	Φ 330 × 22.7	340 × 240 × 345
Quantity (PCS)	3000	30000
Gross Weight (kg)	11 ± 10%	



## Glossary

Item	Description
<b>HCO</b>	<b>Heat CutOff (HCO)</b> With Feed Heater, A Protector that turns on a Feed Heater to cut off circuit.
<b>MC</b>	<b>Main Circuit (MC)</b> All conductive components used in switching devices for closing or disconnecting circuits in a circuit.
<b>CC</b>	<b>Control Circuit (CC)</b> In addition to the main circuit, all conductive parts of the switching apparatus used in the access circuit as the closing operation and / or opening operation of the switching apparatus.
$I_r$	<b>Rated Current</b> The current used to classify an HCO, which is the Maximum current that HCO allows to carry and is able to cut off the circuit safely.
$U_r$	<b>Rated Voltage</b> The voltage used to classify an HCO, which is the Maximum voltage that HCO allows to carry and is able to cut off the circuit safely.
<b>FH</b>	<b>Feed Heater</b> Electric appliances that use electric energy to achieve heating effect.
<b>Breaking Capacity</b>	<b>Breaking Capacity</b> Value of prospective current that a fuse-link is capable of breaking at a stated voltage under prescribed conditions of use and behavior.
<b>Range of Operation Voltage</b>	<b>Range of Operation Voltage</b> Under specified conditions, the protector can operate normally to disconnect the voltage.



# ATTENTION

## Usage

1. When atmosphere press is from 80 kPa to 106 kPa, the related altitude shall be from 2,000 meter to -500 meter.
2. Do not touch the HCO body or electrode lead directly when power is on, to avoid burning or electric shocking.
3. It is necessary to foresee there are possibilities that “Current Carrying Capacity” and “Controlled Fusing Time” may be varied along with the condition change in the substrate thermal capacity, etc. therefore you should check it on your PCB. Generally, when thermal capacity of PCB increases, Current carrying capacity will increase accordingly and Cleaning-time will be longer.
4. This product is designed and produced for only general-use of electronics devices. Therefore, we do not suppose that it is used for the. applications [Military, Medical and so on] which may cause direct damages on life, bodies or properties of third party.

## Installation

1. Surface mounting.
2. Do not apply mechanical stress to the protection body during or after the installation.
3. Ultrasonic-cleaning or immersion-cleaning and so on must not be done to HCO before and after mounted. When cleaning is done, flux on element would flow, and it would not meet its specification. Moreover, a similar influence happens when the product comes in contact with cleaning-solution. These products after cleaning will not be guaranteed.
4. Please do not re-use of the HCO removed.
5. Please avoid doing resin-coating for HCO. The resin might infiltrate into the product, and it doesn't meet the specification when the resin-coating is done to this product. These products after resin-coating will not be guaranteed.
6. Make sure that the terminals of this product are connected properly on the circuit board, and the resistance should be in the range of heater resistance between Terminal P1 - P3 and P2 - P3.

## Replacement

HCO is a non-repairable product. For safety aspect, it shall be replaced by an equivalent HCO, and mounted in the same way.

## Storage

1. HCO must be stored in shaded area where it is not too dusty, with temp. (10 to 30) °C or less with no sudden temperature change, humidity within (30 to 70) % RH, and no corrosive gas in the air. please use them up within 1 year after receiving the goods .
2. This product's terminals use Ag plating. Ag terminals tend to easily get sulfurized or tarnished, please be cautious about their storage environment as follows.
  - (1) Unopen packages also must be stored under the storage condition described in Storage Section 1.
  - (2) After opening packages, products shall be sealed in a bag with high gas proof (e.g. aluminum laminated bag), and must be stored under the storage condition described in Storage Section 1.

### Heat CutOff (HCO) Features & Model List Overview

Rated Operation Voltage $U_r$ (V)	Model					
	84	○	SGP-8445	SHP-8430	SHP-8445	SHP-8460
72	SGP-7230	SGP-7245	SHP-7230	SHP-7245	SHP-7260	SHP-7275
50	SGP-5030	SGP-5045	SHP-5030	SHP-5045	SHP-5060	SHP-5075
48	SGP-4830	○	SHP-4830	SHP-4845	SHP-4860	SHP-4875
40	SGP-4030	SGP-4045	SHP-4030	SHP-4045	SHP-4060	SHP-4075
32	○	SGP-3245	SHP-3230	SHP-3245	SHP-3260	SHP-3275
30	SGP-3030	SGP-3045	SHP-3030	SHP-3045	SHP-3060	SHP-3075
24	○	SGP-2445	SHP-2430	SHP-2445	SHP-2460	SHP-2475
20	SGP-2030	SGP-2045	SHP-2030	SHP-2045	SHP-2060	SHP-2075
14	SGP-1430	SGP-1445	SHP-1430	SHP-1445	SHP-1460	SHP-1475
12	SGP-1230	SGP-1245	SHP-1230	SHP-1245	SHP-1260	SHP-1275
06	SGP-0630	○	SHP-0630	SHP-0645	SHP-0660	SHP-0675
04	SGP-0430	○	SHP-0430	SHP-0445	SHP-0460	SHP-0475
$I_r$ (A) Rated Current	30		45		75	
$U_r$ (VDC) Rated Voltage	100			100		
Product Structure						