HINODE Founded in 1955
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Selecting fuses

Summary of fuse selection is as follows;

1. General subjects on selecting fuses
   1.1 Electric characteristics
      (1) Applied voltage
      (2) Regular current
      (3) Current waves
      (4) Interrupting
      (5) Fuse cut-off signal
   1.2 Installation
      (1) How to connect
   1.3 Environment
      (1) Ambient temperature
      (2) Ambient humidity
      (3) Vibration
   1.4 Operating longevity
      (1) Durability and operating longevity

2. Electronic characteristics

   2.1 Applied voltage

   The rated voltage of a fuse shows the maximum applied circuit voltage. A rated voltage fuse larger than the circuit voltage should be used.

   2.2 Regular current

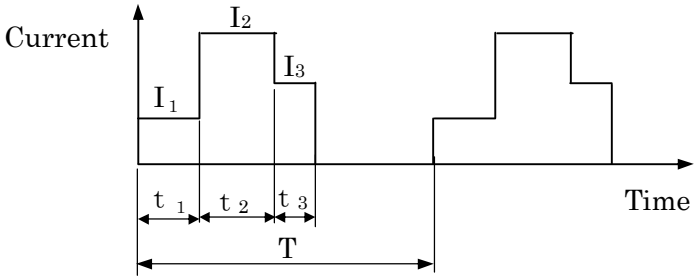
   To lower wear on fuses in the long term and to guarantee operating longevity, reduction against the rated current will be necessary. The recommended reduction coefficients for each series are as follows;

   ・250CF(35SF)、660CF(600CF)、800CF(700CF)、400KH(350KH)、600KH(600KH)
      Less than 0.5 (Regular current, AC sine wave current)
      Less than 0.4 (Pulse wave-form for inverters, power regulators, etc)
   ・250GH、350GH、660GH、600SPF、1000SPF
      Less than 0.8 (Regular current, AC sine wave current)
      Less than 0.6 (Pulse wave-form for inverters, power regulators, etc)
   ・1000GH、1500SPF
      Less than 0.6 (Regular current, AC sine wave current)
      Less than 0.5 (Pulse wave-form for inverters, power regulators, etc)

2.3 Current waves

The effective value of current

$$\text{Circuit current effective value} = \sqrt{\frac{I_1^2 \times t_1 + I_2^2 \times t_2 + I_3^2 \times t_3}{T}}$$



If one cycle (T) is less than 100msec, the rated current of a fuse will be determined by using the reduction coefficient in 2.2 Regular current.

※ If the pausing time is longer than the operating time, the above calculation will not work even though one cycle (T) is less than 100msec. Please contact to us for the details.

2.4 Interrupting

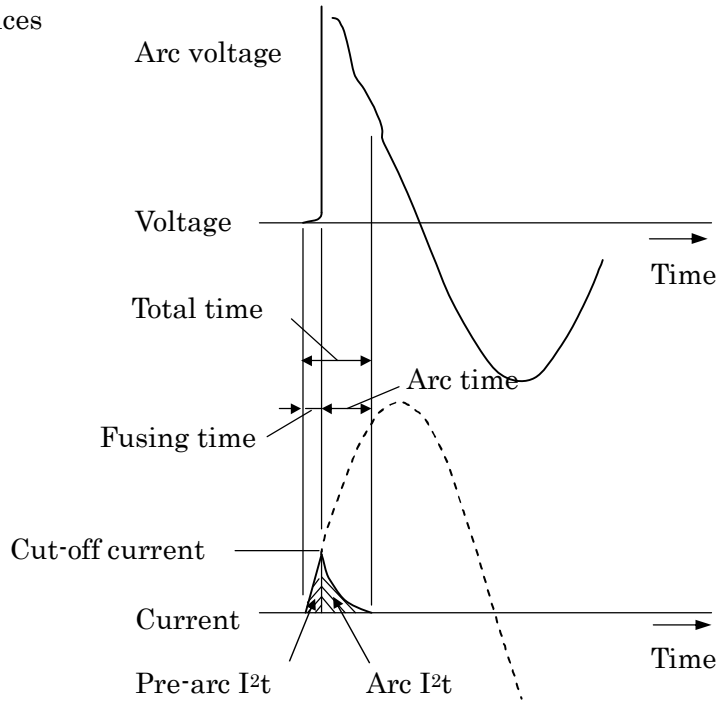
・Breaking capacity

The short-circuit breaking capacity is shown on the fuse. Fuses should be used at a level below the breaking capacity.

・Total I^2t

A combination of pre-arc I^2t and arc I^2t is specified as the total I^2t. The total I^2t in our catalogue is a value at the maximum rated voltage. If a fuse is used at lower circuit than the rated voltage, please refer to the table RMS Circuit Voltage Vs. I^2t Correction Factor in our catalogue. When selecting a fuse, the total I^2t of the fuse should not exceed the I^2t of semiconductor elements.

Voltage/Current-Time at short-circuit current interruption of protect fuses for semiconductor devices



・Cut-off current

The relation between peak let-thru value and current is expressed as the Current Limiting Characteristics. Please refer to our catalogue for the characteristics of each fuse.

・Operating over loaded voltage

When a fuse cuts off, the high arc voltage will occur between the fuse electrodes, and this arc voltage is called the operating over loaded voltage. At maximum, this will be 2 times larger than the rated voltage.

・DC interrupting

Interrupting operation at DC circuit is easily influenced by circuit time constant. Please refer to our catalogue for circuit voltages expressed against the circuit time constant.

・Minimum interrupting current

Protect fuses for semiconductor devices are designed so that they do not cut off and can't be interrupted at a low current. The minimum interrupting current depends on each fuse. Please refer to the minimum interrupting current in our catalogue. Please use fuses in conjunction with other protectors if the short-circuit current of the circuit is lower than the minimum interrupting current.

・Melting time-current characteristics

The curves show the relation between the current and time starting from the over loaded current flow into the fuse until the fuse element cuts off. This characteristics specify its average value, and the current will be fused at ±15% in the current axis.

2.5 Fuse cut-off signal

Some fuses have an indicator that signals interruption.

Fuses with indicators

600SPF、1000SPF、1500SPF

Fuses that can have an indicator installed

250GH、350GH、660GH

※ When ordering a fuse with an indicator, please put an "S" at the end of the ampere rating.
→250GH-100S

A switch for sending a signal electrically at the point of contact is installable to an indicator.

For SPF series

AMS-5VX

For GH series

AMS-3B、AMS-01B、AMS-7

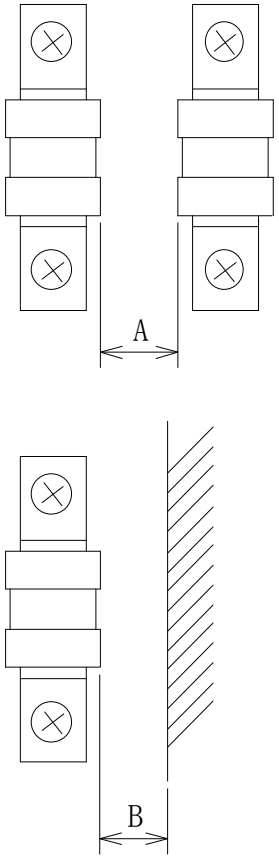
For details, please refer to the option in our catalogue.

3. Installation

Our fuses are divided into 3 types; cylindrical fuses used with fuse holders, circle fuses with

L-shaped terminals fixed with screws, and square body fuses bolted at both ends. Please select the appropriate type by considering usage. Fuse holders for cylindrical fuses are also available. When fuses are installed as described below (parallel), please leave the described space to allow heat to be released.

Voltage	Current	A (mm)	B (mm)
250V	60A	10	5
	175A	20	10
	350A	20	10
	600A	30	15
500V 600V 660V 700V	55A	16	8
	150A	20	10
	250A	20	15
	350A	30	20
	500A	30	20
	650A	30	20
1000V	45A	15	10
	120A	20	15
	225A	20	15
	300A	30	20
	400A	30	20
	600A	30	20

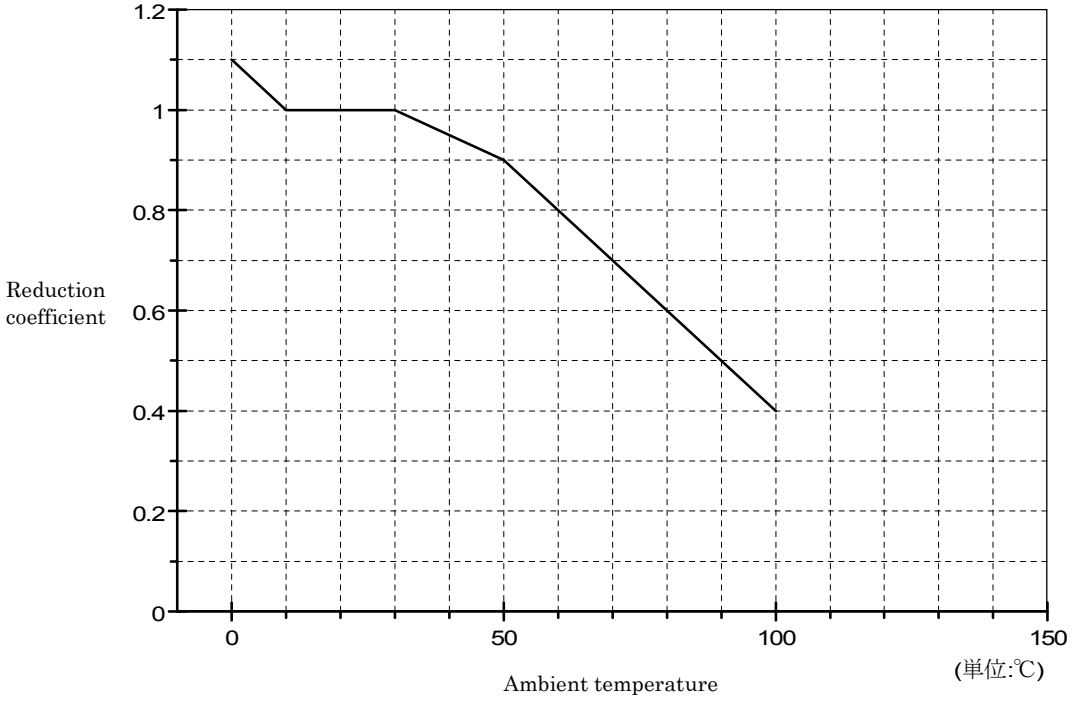


3. Environment

3.1 Ambient temperature

A high temperature test at +90℃ for 150 hours and a low temperature test at -20℃ for 150 hours are guaranteed. The rating of a fuse by the ambient temperature needs to be reduced referring to the following table.

Correction by ambient temperature



3.2 Ambient humidity

The guaranteed humidity-proof test is at +60℃ 95%Rh for 150 hours.

3.3 Vibration

The guaranteed vibration test is at 10-30Hz for 1 minute, total amplitude 1mm 3 distances for 30 minutes per distance.

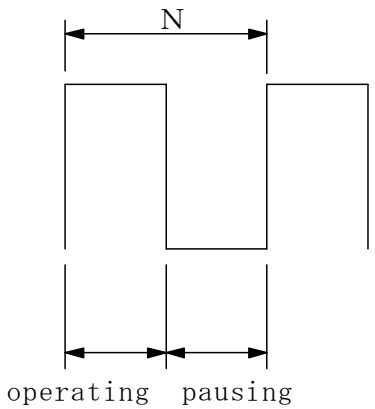
4 . Operating longevity

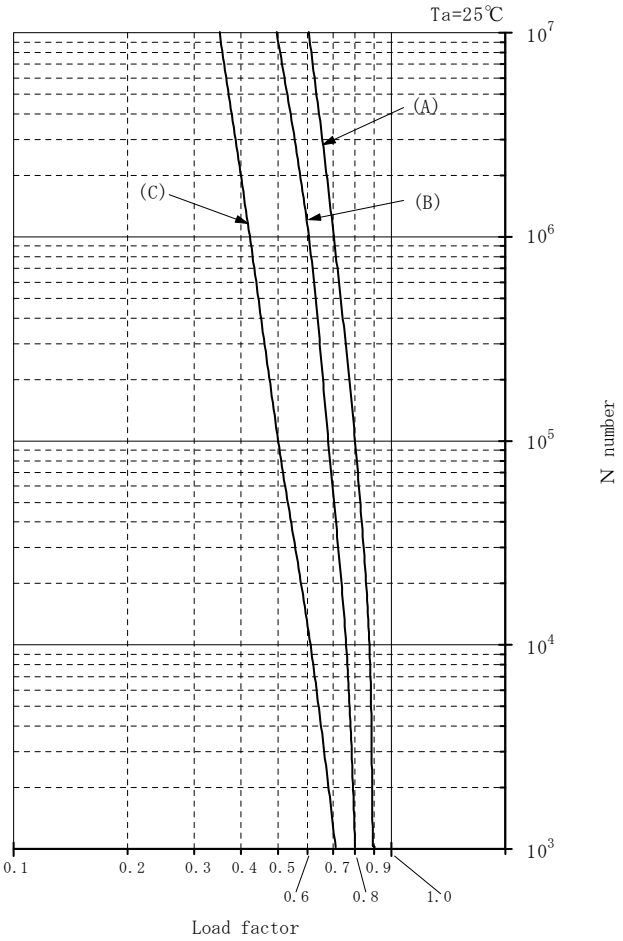
Load factor

(A) Regular load (rectified circuit, etc)
Load factor: less than 0.8

(B) Repetitive operating and pausing.
With adequate pausing time
Load factor: less than 0.7

(C) Intermittent load current in a regular cycle (pulse current for inverter circuit)
Load factor: less than 0.6





$$\text{Load factor} = \frac{\text{Effective value of operating current}}{\text{Rated Current}}$$

- Selection standard for rated current

$$I_N = \frac{\text{Irms}}{T \times S}$$

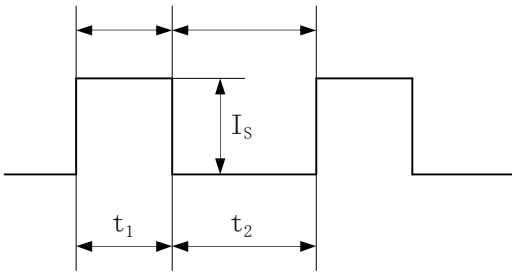
I_N: Rated current
Irms: Circuit current (effective value)
T: Correction by surrounding temperature
S: Load factor

Rated current of fuse $>$ I_N

※ Rated current of fuse $\geqq$ Operating current peak value

Estimated operating longevity against short-term over loaded current

Operating Pausing

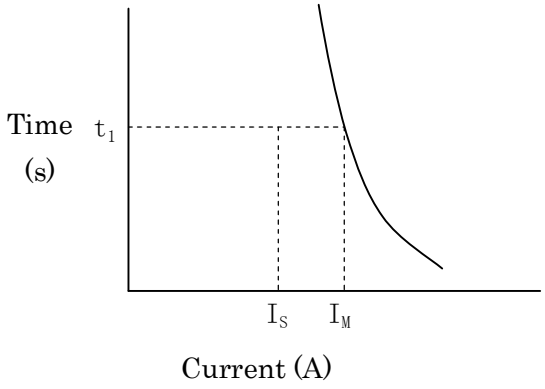


I_S : Test current value

I_M : Fusing current at t_1 time

t_1 : Operating time

t_2 : Pausing time (time for sufficient cooling down)



N : Repetitive operating number

S : Load factor

$$\text{Load factor} = \frac{\text{Operating current for } t_1 \text{ seconds } (I_S)}{\text{Fusing current at } t_1 \text{ seconds } (I_M)}$$

The durability in load factor can be estimated for the following fuses.

- 250GH Series
- 350GH Series
- 660GH Series
- SPF Series

Operating time

① Less than 100ms

② Less than 1s

③ Less than 10s

④ Less than 100s