保险丝选用指南 Guide For Fuse Selection

The purpose of this reference guide is for users to properly select fuses that will provide effective circuit protection for designated electronic components or equipment.
为使用户在设计时、选用合理的保险丝；更好的保护电路、电器元件及设备、特制定保险丝选用指南、供开发工程师参考。

Factors Taken Into Consideration /选用保险丝需考虑的参数

1.According to circuit space: Select the proper fuse physical size.
根据用户在设计电路所安装保险丝的空间、选用适当尺寸的保险丝。

2.According to circuit required mounting mode: Select the proper fuse shape.
根据用户在设计电路所需的安装形式、选用适当形状特征
的保险丝。

3.According to product required safety approvals: Select proper safety agancy approvals for fuse, the approvals: such as UL, CSA, VDE, SEMKO, PSE, CCC, EK...and so on.
根据用户产品所需的安规认证、决定选用适当安规认证的保险丝。

4.According to the available circuit voltage: Determine the proper fuse voltage rating.
根据用户产品电路的有效电路电压、决定选用保险丝的额定电压。

5.According to the maximum normal running current of the circuit: Initially select the appropriate fuse current rating (In).

根据用户产品电路的最大正常工作电流、初步选定保险丝的额定电流(In)。

*Considered the fuse decaying factors.

*考虑保险丝的安全衰减率。

*Considered fuse ambient temperature derating.

*考虑保险丝使用环境温度衰减率。

6.Current pulse is considered/考虑电流脉冲：

*Calculated the maximum current pulse I^2t value in circult.

*计算电路中产生的最大脉冲 I^2t 值。

*Calculated the required I^2t value of fuse.

*计算所需保险丝的 I^2t 值。

Time-lag fuse typically is recommended when distinctive current pulse is specified.

若用户在设计电路中存在脉冲并且有特别要求、一般选用慢熔断型保险丝。

7.Select the fuse type.

最后选定保险丝的规格。

8.The selected fuse undergoes test runs in the circuit/product.

选用的保险丝规格样品安装在电路中正常运行测试。

Selection Steps / 选用保险丝的步骤

1. Fuse Physical Size

第一步：选用保险丝的尺寸形状

The fuse physical size selection determines the space limit of circuit in design and the required mounting mode.

Note: For getting the detailed specification information, please connect us.

选用何种尺寸形状特征的保险丝、主要取决于用户设计电路的空间和电路所需的安装要求。

注：如需保险丝的尺寸形状特征、各规格保险丝详细规格书，请联系我们。

2.Safety Agency Approvals

第二步：选用所需安规认证

According to product requirement, to select a fuse that obtains the relevant & required safety agency approvals.

选用何种安规认证的保险丝、主要取决于用户产品所需通过的安规认证。

3.Voltage Rating

第三步：选用保险丝的额定电压

For general circuit protection, the fuse voltage rating should be greater than, or equal to the available circuit voltage. The fuse is only to be used in the circuit that smaller than, or equal to the available voltage. For example, a 125V fuse only can be used in the circuit that smaller than, or equal to 125V and can not be used in the circuit in 250V. On the contrary, a 250V fuse only can be used in the circuit that is smaller than, or equal to 250V, including 125V.

选用保险丝的额定电压、需选用大于或等于电路中所使用有效电压、即：保险丝只能用在小于或等于使用有效电压的电路中。具体为：额定电压为:125V 的保险丝只能用在小于或等于 125V 的电路中、不能用在 250V 的电路中。额定电压为:250V 的保险丝只能用在小于或等于 250V 的电路中、 也可以用在 125V 的电路中。

4. Current Rating (In)

第四步：选用保险丝的额定电流(In)

Current rating of the fuse(In) = The maximum steady running current / (Fuse decaying ratio* The appliance ambient temperature derating).

保险丝的额定电流 In= 回路最大稳定电流 / (保险丝的安全衰减率*使用环境温度衰减率)。

(1). Safety Decaying Factors / 保险丝的安全衰减因素

Because of the differences between the actual appliance circuit and the laboratory test conditions, (such as the contacting resistance between fuse clip / holder and fuse, the difference circuit connecting cable size.) At the normal temperature 25±5℃ environmental condition, on purpose to ensure the continuous and reliable characteristics of fuse. As above, it is requested to consider the fuse decaying factors, referring to following simple calculation ratio.

因保险丝在实际电路使用中与实验室测试条件的差异(如: 客户在安装保险丝所使用的保险丝盒、保险丝夹产生的接触电阻和电路中导线横截面积等差异)、要保证保险丝在 25±5℃ 条件下能持续可靠地工作、在选用保险丝需考虑保险丝的安全衰减因素、请参考如下简易计算公式。

*UL Standard Fuse:

current rating(In)= The maximum steady current of circuit / 0.75

美规制品(UL 标准): 保险丝额定电流(In)=回路最大稳定定流 /0.75

*IEC Standard Fuse:

current rating(In)= The maximum steady current of circuit / 0.90

欧规制品(IEC 标准): 保险丝额定电流(In)=回路最大稳定定流 /0.9

* JIS Standard Fuse:

current rating(In)= The maximum steady current of circuit / 0.85

日规制品(JIS 标准): 保险丝额定电流(In)=回路最大稳定定流 /0.85

(2). Ambient Temperature Derating / 使用环境温度衰减率

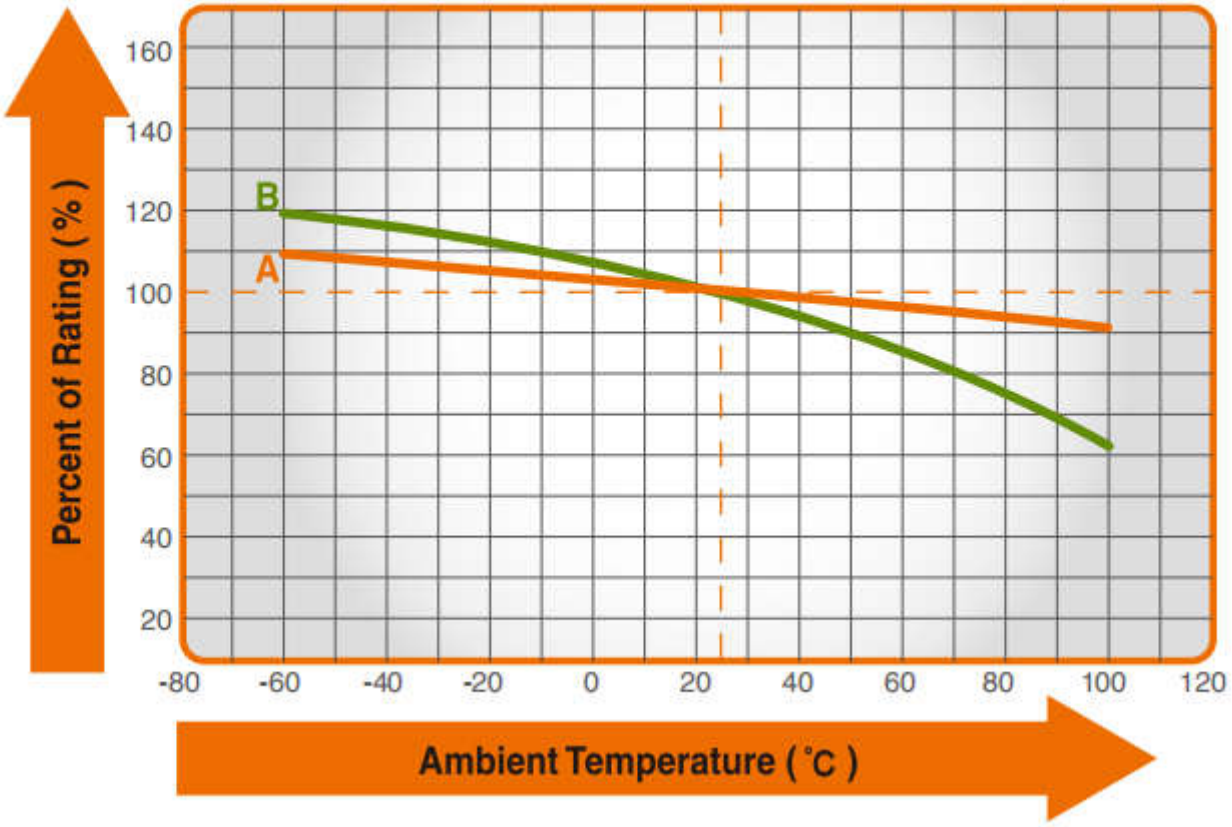
The fuse carry capacity tests are performed at 25±5℃, so, at a higher temperature (higher than 30℃), continuous current-carrying capacity will be influnced and decreased, please refer to the below chart as shown (See Picture 1):

当保险丝在 25±5℃环境温度条件下使用时、保险丝的额定电流值不受环境温度影响；当保险丝在大于 30℃环境温度下使用时、环境温度对保险丝额定电流承载能力有很大影响。所以在选用保险丝时一定要考虑环境温度对保险丝的影响。(见图示 1)

Chart Showing Effect of Ambient Temperature on Current-Carrying Capacity (Typical)

Picture 1 / 圖示1

環境溫度-電流曲線



Curve A / 曲 线 A:

For FF, Fast-Acting and Time-Lag type fuses.

特快熔断、快熔断和慢熔断保险丝曲线。

Curve B / 曲 线 B:

For the traditional Slow-Blow fuses

传统的慢断保险丝曲线。

To calculate the current rating (In) after considering above factors and select the proper fuse current rating which must greater than or equal to current rating (In).

以上计算出保险丝的额定电流 In、在选用保险丝时、需选用大于或等于 In 的最佳额定电流值的保险丝。

5. Pulse

第五步：考虑电流脉冲

The pulse particularly means the big peak and endure short time (less than 10ms) instantaneous current (such as surge currents, start -up currents, inrush currents and transients). If selected fuse is able to endure the inrushcurrent (for the normal and reasonable requirements) and will not open, then, to consider the pulse factor is necessity.

电流脉冲是指那些电流峰值大、而持续时间短(小于 10ms)的瞬间电流(诸如开机瞬间、电压变化和其他因素所产生的冲击电流、起动电流、涌入电流和瞬变电流)。如果要要求保险丝能够承受正常要求下的电流脉冲而不会熔断、在选用保险丝时、就一定要考虑脉冲对保险丝的影响。

At first, to calculate the pulse I^2t based on the maximum pulse of actual circuit.

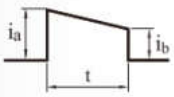
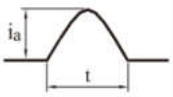
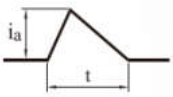
首先：根据在实际使用电路中产生的最大脉冲、计算出此脉冲的 I^2t 值：

$$I^2t = \int_0^t i^2 dt$$

Generally, select the appropriate pulse waveform which are shown as below to calculate the I^2t .(See Picture 2)

通常是根据所测出的脉冲波形、对照下表(见图示 2)对应最近似的波形、计算出脉冲的 I^2t 值。

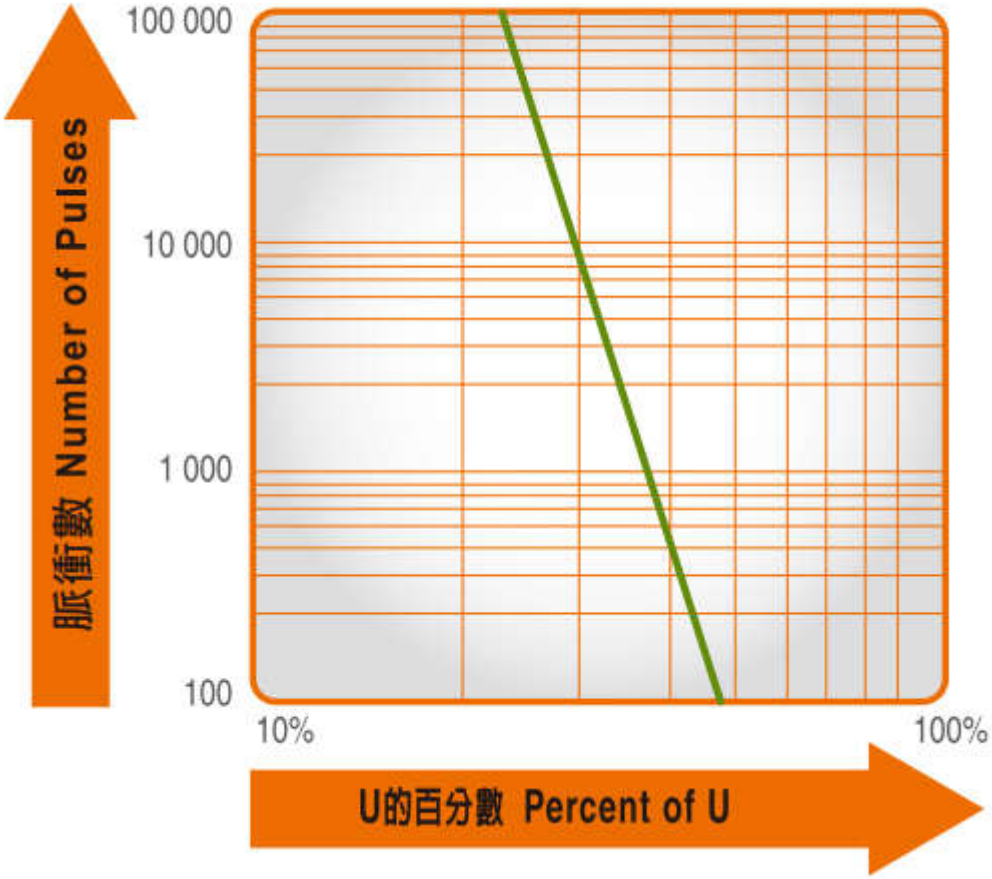
Picture 2 / 圖示2

NO. 圖形編號	A	B	C	D	E	F
Waveform 波　形						
Formulas 計算公式	$I^2t = i_a^2t$	$I^2t=(1/3)(i_a^2+i_ai_b+i_b^2)t$	$I^2t=(1/2)i_a^2t$	$I^2t=(1/3)i_a^2t$	$I^2t=(1/5)i_a^2t$	$I^2t=(1/2)i_a^2t$

Secondly, realize the cycle endurance of fuse and select the pulse cycle times. (See Picture 3)

首先：利用脉冲循环承受能力、客户选定能承受该脉冲的次数。(见图示 3)

Picture 3 / 圖示3



U = Ratio (Pulse I^2t /Average Melting I^2t)

曲線U 表示： 脈衝I^2t 值與所需保險絲的I^2t值之比：

Pulse Cycle Withstand Capability:

承受循環脈衝能力：

100,000 pulses U=22% of Nominal melting I^2t	當U=22%時、能承受100,000次脈衝
10,000 pulses U=29% of Nominal melting I^2t	當U=29%時、能承受10,000次脈衝
1,000 pulses U=38% of Nominal melting I^2t	當U=38%時、能承受1,000次脈衝
100 pulses U=48% of Nominal melting I^2t	當U=48%時、能承受100次脈衝

Note: Adequate time(10 seconds) must exist between pulse events to allow heat from the previous event to dissipate.

注：脉冲与脉冲之间必须留有足够的时间间隔(10 秒)、以使前一过程的热量能够散失。

Finally, consider the pulse cycle withstand capability (U) and pulse I^2t, and then to figure our the nominal melting I^2t of fuse.

最后：利用脉冲循环承受能力和电路中脉冲 I^2t 值、计算所需保险丝的 I^2t 值：（所需保险丝的 I^2t 值 = 脉冲 I^2t 值 / U）

Average Melting I^2t = Ratio(Pulse I^2t / U)

U = 脉冲 I^2t 值 / 所需保险丝的 I^2t 值

After Calculating the require fuse value I^2t and the fuse itself melt thermal energy rating value I^2t and then compare them; Select the on which fuse melt thermal energy rating value I^2t is greater than, or equal to the relevant specification require to fuse value I^2t.

计算出所需保险丝的 I^2t 值与保险丝本身的额定熔化热能 I^2t 值

对比; 选用保险丝额定熔化热能 I^2t 值大于或等于所需保险丝的 I^2t 值的相应规格。

6. Tested in the Actual Circuit

第六步：测试

The selected fuse sample must be tested in the actual circuit t verify the characteristic and selection. The tests should be performed under the conditions of normal and fault to ensure the fuse will properly operate in the circuit.

选定保险丝的规格后、依据本公司提供之样品必须安装在实际电路中进行测试、验证所选用的保险丝是否合理；此验证应包括正常工作条件及故障条件下的测试、以确保所选用的保险丝规格能在被保护的电路中正常工作。