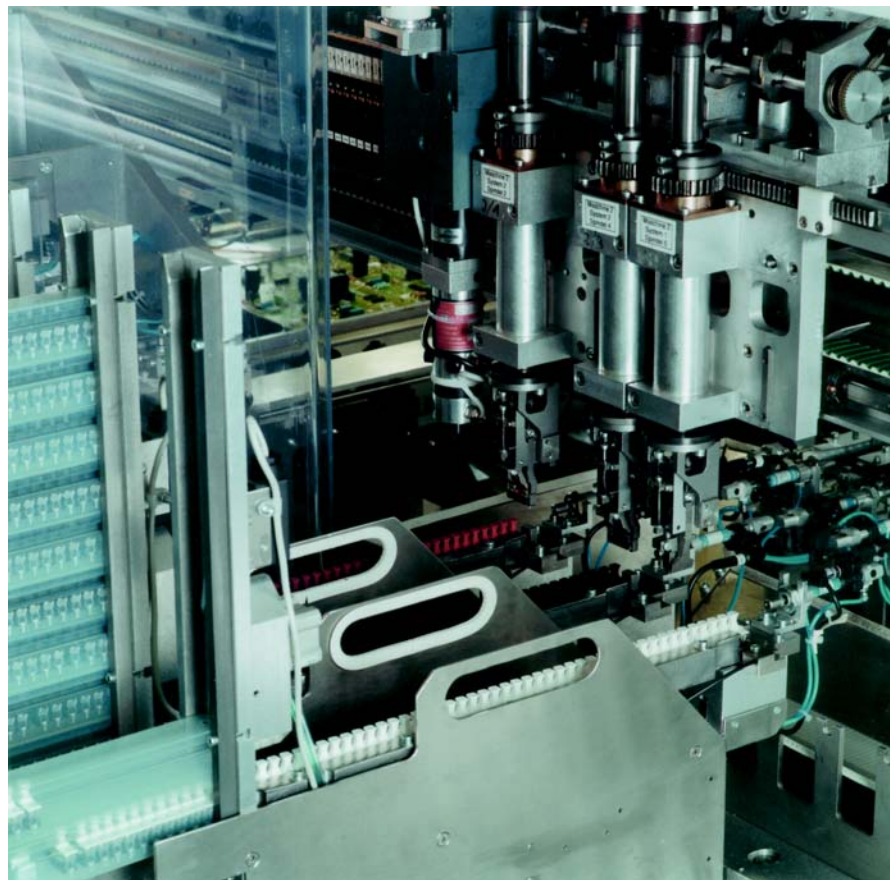




**Littelfuse®**



# FUSE-HOLDERS APPLICATION NOTE

## INTRODUCTION

5x20 mm fuses<sup>1)</sup> continue to be the most widely used components for primary and secondary circuit protection.

Although the technology is over 50 years old, the current usage is still estimated to be around 3 billion units per year. These fuses remain popular because:

- they are available anywhere in the world
- they are both reliable and inexpensive
- they offer breaking capacities up to 1500 A

Depending on the requirements and expectations of the designer, there are various methods of mounting the 5x20 mm fuses in the electronic appliance. These range from fuse clips, normally the cheapest option, to comprehensive shock safe fuse holder systems.

This Application Note is intended to give an overview of the available systems, the strength and weaknesses of each combination, and to help the designer in the selection of the best fuse and holder solution for each application.

1) This application note refers primarily to 5x20 mm fuses because these represent the vast majority of miniature fuses. For 6,3 x 32 mm and other dimensions please visit our website [www.wickmann.com](http://www.wickmann.com) or call the WICKMANN hotline no. +49-2302-662107.



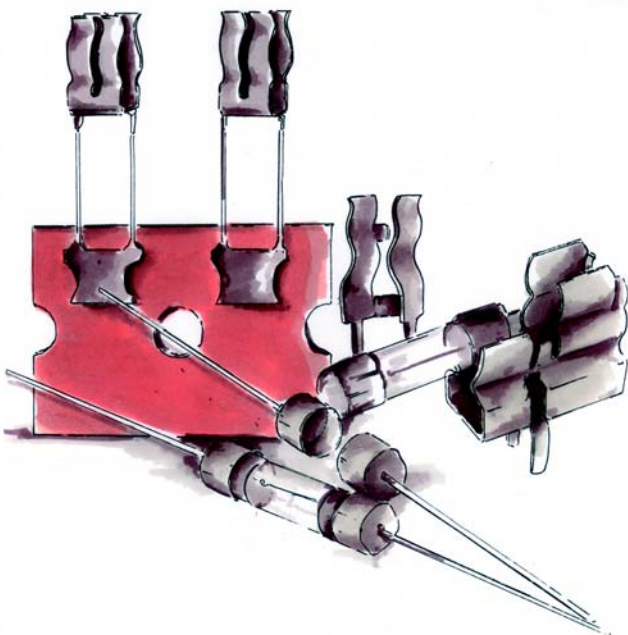
## MAJOR BENEFIT TO THE USER

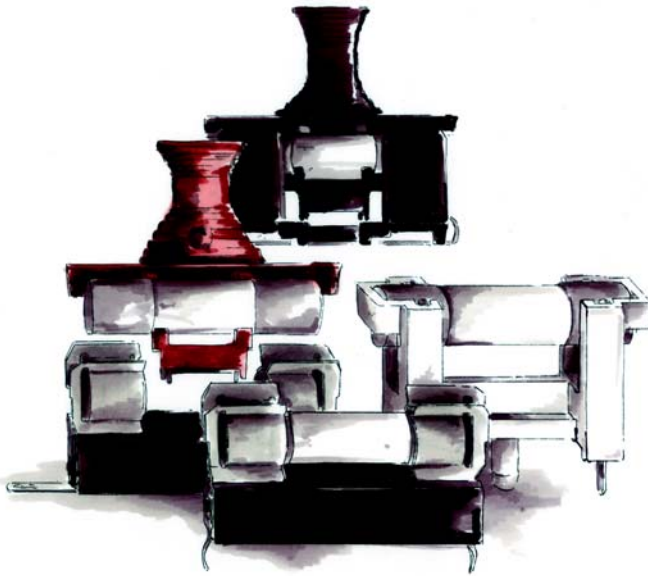
By providing a protection system consisting of a fuse holder fitted and tested with the fuse in the factory, packaged in a tube ready for automatic feed to the pc board, WICKMANN provides the user with a secure product that can be used with confidence. Additionally, colour coded covers or adaptors can be provided to designate the current rating of the fuse.

## SELECTION OF THE FUSE AND HOLDER SOLUTION

The first step is to answer the following questions.

- Will the fuse need to be accessible for replacement?
- How often will the fuse need to be replaced?
- Should the end customer of the appliance have access to change the fuse?
- Should the fuse only be accessible from outside the appliance?
- How much is available to spend on safety and reliability?





## FUSE AND FUSE HOLDER OPTIONS AVAILABLE

### 1. Fuse fitted with leaded caps

The fuse complete with axial leads is provided on tape and reel ready for auto insertion in the pc board. This provides a simple and inexpensive option, but has the following limitations:

- Not easily replaceable
- Current carrying capacity limited to  $\leq 8\text{ A}$
- Possible solder reflow problems within the fuse during soldering processes

### 2. Fuse fitted into fuse clips

Fuse clips offer the most common inexpensive method of mounting the fuse to the pc board. The major drawback of this option is that two fuse clips have to be aligned and spaced correctly before the fuse can be fitted. This entails at least 3 separate operations in the assembly process. This option is also inexpensive, and subject to the following limitations

- Maximum rated current is  $\leq 10\text{ A}$
- Maximum power dissipation is  $\leq 2.5\text{ W}$
- Minimum of 3 assembly operations to fit the fuse

### 3. Fuse fitted into open fuse holder

The open fuse holder option offers a perfect protection device, combining the advantages of flexibility, safety, and easy replaceability of the fuse, in a cost-effective solution. WICKMANN offers a range of open holders from the low cost type 649, through the mid-range type 646 to the high performance type 65x. Future WICKMANN developments include holders to withstand the higher temperatures required for lead free solder.

Since the fuse is a safety critical component, it is essential that the correct rated fuse is fitted in the circuit. Tests carried out on the assembled pc board will be unable to detect if the correctly rated fuse is fitted. WICKMANN offers a pre-tested protection system with the correct fuse fitted into the fuse holder and supplied in a cartridge suitable for cost effective automatic insertion. An additional option of a colour coded cover or adapter to indicate the fuse rating is also available.

The open fuse holders are currently available as through-hole versions, but new types will be available in both through-hole and surface mount versions.

The main advantages of using the open holder solution are:

- Maximum rated current is  $\leq 10\text{ A}$
- Maximum power dissipation is  $\leq 4\text{ W}$



## Application vs Holder System



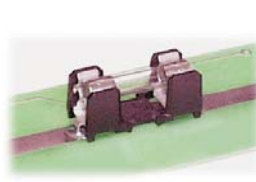




	 PCB low performance	 PCB med performance	 PCB high performance	 Panel Mount
 Clips/Caps	++	+	-	--
 Open/Systems <sup>1)</sup>	+	++	++	+
 Shock-safe	--	-	+	++

Table shows cost/performance rating and preferred application

<sup>1)</sup> System of fuse and holder pretested

- Single operation to fit protection system to pc board
- Factory tested system ensuring correct fuse is included
- Optional colour coded cover or adapter to indicate correct fuse rating
- Reasonable cost solution

This option provides high end protection with high safety for all users. The main advantages being:

- Fuse can be easily changed as required
- Maximum rated current is  $\leq 16$  A depending on type
- Maximum power dissipation is  $\leq 4$  W depending on type
- Higher safety levels

### 4. Fuse fitted in shock safe fuse holder

In applications where it is required to be able to change the fuse from the exterior of the appliance, WICKMANN offer a full range of shock safe fuse holders. Shock safe means that it is safe to remove the fuse from the holder with no risk of touching the "live" connections.