

## Fuseology

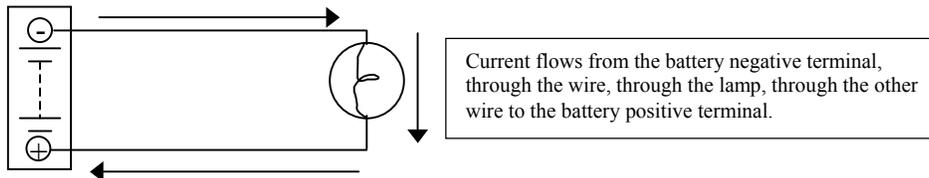
By Allan Brown

What is a fuse, what is it for, how does it work and how do you choose one. What does the rating 17/35 mean to our MG's?

A fuse is considered to be a current-sensitive device that is designed as the intentional weak link in an electrical circuit. The function of a fuse is to provide circuit protection by reliably melting — “fusing - blowing - opening”— under overcurrent conditions and thus safely interrupting the flow of current. It has to do this before there is any damage or overheating to the wiring and other circuit components.

### What is Current?

The term current is the flow of electricity through a device such as a lamp, motor and so on. The amount of current that flows is determined by the voltage, which can be considered as pressure, and the resistance of the device, how much it says no I don't want any current. Current is measured in Amps (A or I), Voltage (V) in Volts and Resistance in Ohms ( $\Omega$ )



So, for a given resistance, if you increase the voltage or pressure, then the current will increase. Conversely, for a given voltage, if you decrease the resistance, the current will increase. This is known as Ohm's Law that states

$$A = \frac{V}{\Omega}$$

### What is an Overcurrent?

An overcurrent is any current that exceeds the ampere rating of wiring, equipment or devices under normal conditions of use. The term “overcurrent” includes both overloads and short circuits.

#### *Overloads*

An overload is an overcurrent that is confined to normal current paths, in other words, nothing has changed in the way the device is connected or to the wiring in between. An overload occurs when the current exceeds the value for which the wires or equipment are rated. This can happen when too many devices are connected to the circuit, or when a device connected to the circuit malfunctions in a way that causes it to draw higher than normal current.

#### *Short Circuits*

A short circuit is current out of its normal path. It occurs when accident or malfunction creates an unintended path for the electricity to flow from the battery or alternator to ground. This shorter, more direct path to ground bypasses the resistance normally offered by the wiring and devices connected to the circuit. With virtually no resistance left to impede current flow, the voltage forces higher and higher current to flow through the wires to the point of the short. Under such a condition, the current will quickly build to such a high level that the heat generated can cause

insulation to burn and equipment to be damaged unless the circuit is opened through the use of a fuse.

### **Fuse Selection Parameters**

When selecting fuses, the following parameters should be considered:

#### ***Voltage Rating***

The voltage rating, as marked on a fuse, indicates the maximum voltage of the circuit for which the fuse is designed to operate safely in the event of an overcurrent. Basically, you don't want any potential sparking to negate the operation of the fuse. The voltage rating for auto fuses is 32 volts, however, higher voltage rated fuses will work.

#### ***Time-Current Characteristics***

A fuse's time-current characteristic is "how fast does it respond to different overcurrents"? All fuses have inverse time-current characteristics, so opening time **decreases** as overcurrents **increase**. Some fuse types are designed with a large inverse time-current characteristic, these fuses are known as slow-blow or time delay. Auto fuses are of this type.

On MG's we have fuses labelled as 17A/35A. A regular 17A fuse will open at just over 17A. The 17A/35A slow-blow will pass current up to 35A depending on the time duration of the current over 17A. It is also dependant on how fast the current rises over the 17A.

#### **Why Do This?**

Many devices such as lamps and motors take a large amount of current when they start up. Then, once going, the current falls to a much smaller value. A regular fuse will not handle the excess or overcurrent. The slow-blow type will.

However, if the overcurrent rises very fast over the 17A, e.g. a short circuit or stalled motor, then the fuse will blow. This protects the wiring but allows the operation of things such as lamps and motors.

This allows manufacturers to use much thinner wire and smaller connectors resulting in savings in cost and weight.

#### **Replacing Fuses**

It is common practice to replace the 17A/35A slow-blow with a 20A regular type. This should be considered a temporary measure till the proper fuse is obtained.

You may be unable to find 17A /35A slo-blo fuses. I did find 15A /30A 32V fuses from Littlefuse ([www.littelfuse.com](http://www.littelfuse.com)) part number 313015. I happened to have a few of these and put them in my 78B. They have been there for a few months and are working well. I have had no failures due to the slightly lower rating. I suggest using these rather than the 20A regular fuses, as they are more suited to the car's electrical system.

#### **Why Fuses Fail — as opposed to being “blown”**

Transient pulses of overcurrent are commonplace in vehicle electrical systems. The transient overcurrent pulses affect the life of automotive fuses. So, be aware that, like other components, fuses do degrade with time and will fail. Just because a fuse has blown, it does not necessary mean you have a problem. It could just be a bad or worn out fuse.