

Fuses and Fuse Holders

Why do I need to use fuses?

Properly selected and installed fuses protect people and property by limiting damage and reducing the likelihood of fire and explosion that can occur when an overload or a short circuit occurs.

Why isn't a circuit breaker always good enough?

United States National Electrical Code and other jurisdictions accept circuit breakers for branch circuit protection, but typical circuit breakers take longer to interrupt the flow of energy than a fuse in the event of a failure. The additional time at high current flow allows more damage to wires and components which results in longer downtime and more costly repairs.

Why do I need a DFJ or semiconductor fuse when I use an solid state power controller?

Most fuses approved for branch circuit protection are not fast enough to protect solid state power controllers from being damaged or destroyed when a short circuit occurs. To prevent costly damage in the event of a failure that causes a short circuit, a DFJ or semiconductor fuse is required.

Do I have to get my DFJ or semiconductor fuses from Watlow?

In order to achieve the Short Circuit Current Ratings (SCCR) published for Watlow products, the power controller must be protected by one of the fuses with which they were approved. Watlow offers these fuses directly and lists the brand names and models numbers of approved fuses in the fuse specification sheets. It is not necessary purchase fuses from Watlow, but the SCCR applies only when the controllers are used with the specified fuses.

What is the difference between DFJ fuses and the semiconductor fuses that Watlow has offered for years?

When properly sized, either is appropriate for protecting an solid state power controller, and both are tested and approved for achieving the SCCR specification listed for Watlow power controllers. DFJ fuses are also approved for branch circuit protection. Therefore, one DFJ fuse can be used where in the past both an approved, branch-circuit fuse and a fast-acting, semiconductor fuse would have been used. This can reduce the component count, complexity and wiring costs for electrical panels and equipment. When semiconductor fuses are used, separate branch circuit protection is required.

What Watlow products should be protected by DFJ or semiconductor fuses?

DFJ and semiconductor fuses are offered to protect Watlow DIN-a-mites, CZRs, SSRs and EZ-ZONE[®]ST controllers. Note that DIN-a-mite Style D, Power Series and QPAC power controllers include semiconductor fuses on-board which are sized to protect the power controller.

How do I choose a DFJ fuse?

There are two criteria that are important in selecting the correct DFJ fuse for an application: the fuse's current rating and its I²T specification:

- First, select a fuse rated for at least 125% of the connected load current or the next fuse size up but no more than 160% of the connected load current. The connected load current is the rated current load for the component to which power is switched by the power controller, for example, the current at which the heater is rated, not the power controller rating, which should be greater.
- Second, make sure the fuse's I²T is lower than the I²T specification of the power controller to be protected.

How do I choose a semiconductor fuse?

There are two criteria that are important in selecting the right semiconductor fuse for an application: the fuse's current rating and its I^2T specification:

- First, select a fuse rated for at least 125% of the connected load current or larger. The connected load current is the rated current load for the component to which power is switched by the power controller, for example, the current at which the heater is rated, not the power controller rating, which should be greater.
- Second, make sure the fuse's I^2T is lower than the I^2T specification of the power controller to be protected.

This is similar to the selection criteria for a DFJ fuse but it allows a fuse with a higher current rating to be selected. Because the semiconductor fuse cannot act as branch circuit protection, it is not limited to 160% of the connected load as the DFJ fuse selection is.

What is SCCR?

The SCCR rating represents the maximum level of short-circuit current that the component or assembly can withstand and is used for determining compliance with NEC[®] Article 110.10. SCCR is a safety consideration that gives a rating, that a circuit or piece of equipment will survive without producing a dangerous arc flash. An arc flash results in an explosion caused by an insulation failure or air ionization from an over voltage event. An arc flash with 1,000 amperes or more can cause substantial damage, fire or injury. The massive energy released in the fault rapidly vaporizes the metal conductors involved, blasting molten metal and expanding plasma outward with extreme force. The reason behind the code is to prevent fire, injury or death. For more see the Watlow white paper on this subject:

http://www.watlow.com/downloads/en/whitepapers/Short%20Circuit%20Current%20Ratings_d1.pdf

What is I^2T ?

The I^2T specification for a component indicates how quickly it blows at a given current. Clearly in a safe design the fuse blows before the power controller. That is why it is important to select a fuse that has a lower I^2T rating than the power controller it is to protect.

Does the I^2T specification vary with voltage?

Yes, I^2T specification for both fuses and power controllers are different at different voltages. Generally the fuse rating is lower (blows faster) at lower voltages. The Watlow specification sheet for the fuses gives the ratings at 480V and these values are safe to consider for lower voltage applications. For applications at higher voltages or in cases where the fuse selection criteria does not make it clear which fuse to select, contact Watlow technical support or your Watlow representative.