PIQ Quiz Notes

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New Standards in PV Circuit Protection

Solar Power Technology Continues to Evolve

As the market for solar energy continues to grow, the technology and equipment used to harness and distribute photovoltaic power continues to evolve. Output efficiencies have improved, systems are more reliable and installations have become safer. Over these past several years Mersen has invested countless resources, expertise and initiative contributing toward developing the proper codes, standards and products mandated by this emerging industry. Research prepared by Mersen will deliver a higher level of understanding for solar photovoltaic system behavior, potential fault conditions and how to prevent these same fault conditions from damaging your installation.

Question: Which new Underwriters Laboratories (UL) product standard defines the performance characteristics for fuses to be installed in photovoltaic systems? Is it:

A. UL 248 **C. UL 2579**
B. UL 1741 D. UL 489

UL 2579 & Fuses for Photovoltaic Systems

UL 2579, officially titled "Fuses for Photovoltaic Systems," was first released as an outline of investigation in December 2007. Since its inception, and with the help of many industry experts including Mersen, UL 2579 is now in its sixth revision which was released in July 2010. Historically specifying engineers, integrators and installers have been using circuit protection components and solutions that were originally designed for AC power and control applications. Although these products performed as needed they were not necessarily the optimal solution for photovoltaic applications. UL 2579 is a product standard written specifically for fuses intended to be used for photovoltaic circuit protection. This standard makes it easier for users to select the proper products quickly and confidently. It allows fuse manufacturers to obtain a UL Listing on fuses that conform to the standard, even for voltages up to 1500 Volts DC, which was not possible in the past. Most importantly, fuses listed to UL standard 2579 will deliver improved product performance and system longevity adding to the overall value of your solar power installation.

PV Fuses are Subject to Additional Testing

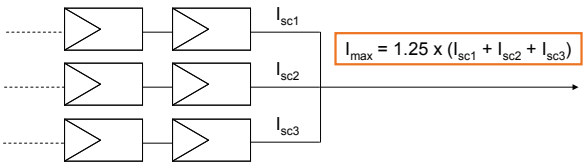
Unlike general purpose fuses, fuses listed to UL 2579 are subject to additional testing simulating the service environment conditions of photovoltaic installations. There are three new tests that fuses are required to pass within UL 2579. These tests include Verification of Freedom from Unacceptable Levels of Thermally Induced Drift, which tests the fuse interrupting capabilities after exposure to numerous night to day climate transition; Verification of Functionality at Temperature Extremes, which tests the fuse interrupting capabilities at the hottest and coldest anticipated temperature extremes of a typical photovoltaic installation; and Current Cycling, which tests the fuse reliability and longevity when subject to constant change in temperature and various current loads that would typically be experienced in photovoltaic applications.

Question 2: According to National Electric Code requirements what multiplication factor must be applied to the PV modules rated short circuit current value in order to determine the proper nominal fuse ampere rating for your photovoltaic application? Is it:

A. 156 percent C. 135 percent
B. 125 percent D. 200 percent

Article 690 Solar Photovoltaic Systems

Article 690 of the National Electric Code defines installation requirements pertaining to solar photovoltaic electrical energy systems. When sizing fuses for string and array protection there are two sub-articles that must be followed. Subarticle 690.8(B)(1) reads the maximum current shall be the sum of parallel module rated short circuit currents multiplied by 125 percent. What does this mean? Let's use an example of three PV strings in parallel. The short circuit current rating of each string of PV modules is defined as I_{SC1}, I_{SC2}, and I_{SC3} as shown in the schematic. In order to determine the maximum current, or I_{max}, of our three string PV array we will take the sum of the short circuit current ratings of our three PV strings in parallel and multiply the sum by 1.25, or 125 percent. The result will give us the maximum current of our array



The second subarticle that we must follow when sizing fuses for PV systems is subarticle 690.8(B)(1), which reads the overcurrent devices shall be sized to carry not less than 125 percent of the maximum currents calculated in subarticle 690.8(A)(1). In order to find the nominal current value of our fuse, use this formula: $I_n = I_{max}$ x 1.25.

Selecting PV Fuse Ampere Ratings per NEC Guidelines

When selecting fuse ampere ratings per NEC guidelines use the following formula:

$$I_n = I_{sc} \times 1.56$$

I_n = Nominal Fuse Ampere Rating
I_{sc} = PV Modules Rated Short Circuit Current

After calculating I_n, if the calculated ampere rating is not a standard fuse ampere rating, it is allowed per NEC guidelines to select the next higher standard fuse ampere rating.

Explore Mersen's PV Fuse Solutions

Mersen's new Helio Protection fuse line Introduces the industry's first UL 2579 listed range of dedicated photovoltaic fuses. The HP6M, HP10M,and HP6J provide superior overcurrent protection at the combiner box and inverter levels and covers applications ranging from 1 to 400A, 600VDC, and 1000VDC.

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