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WHAT'S NEW WITH CONNECTORS FOR SOLAR PHOTOVOLTAICS

Getting a jump on the proposed UL 6703A standard.

by michele moon

Michele Moon
is a Product Manager at Anderson Power Products.

Contractors in the solar photovoltaic (PV) industry have been quick to use connectors rather than hardwiring wherever possible, because connector use greatly improves efficiency and reduces installation costs. One important feature of the new crop of connectors designed for use in the PV industry is their recognition under the pending UL 6703A standard, which covers multi-pole connectors for use in PV systems, including inverters, micro inverters, combiner boxes, battery power, and storage systems.

While not yet a requirement, some contractors are seeking products that meet the standard so they can be proactive about ensuring their installation meets future requirements.

What is the UL 6703A standard?

The rapid growth in the introduction of solar PV technology has resulted in continual updates to electrical requirements and standards. NFPA 70 and National Electrical Code (NEC) 2008 addresses safety at PV installations, including routing PV source and output conductors, directories for remote multiple inverters, and qualification requirements for installers. In addition, NEC 2008 requires that connectors used in PV installations have a first make/last break ground, and a locking feature that require a tool to unlock. The proposed UL 6703A test standard covers connectors intended for use in wiring methods that are outlined in NEC Article 690.

To meet the UL 6703A standard, a connector has to pass rigorous impact, thermal cycle and humidity testing that simulates conditions the connector may be exposed to.

For the impact test, the connector is placed in an environmental chamber and brought down to a temperature of -35° C. Then a 2-inch round steel ball weighing 1.18 pounds is dropped on the connector from a height of 51 inches. The connector passes the test if no live components are exposed after impact.

The thermal cycling test simulates truly worst case weather temperature change scenarios. For a period of 200 hours, the connector endures cycling from temperatures ranging from a low of -40° C to a high of +90° C. During each cycle, the upper and lower extremes are each held for 30 minutes.

The humidity test is similar, with the connector subjected to ten cycles at temperatures ranging from a low of -40°C to a high of +85° C, at a relative humidity of 85 percent.

Connectors reduce installation costs

Solar developers are using connectors where possible to improve efficiency and reduce installation costs on solar projects – It is far less labor intensive to use connectors than to hard wire projects using licensed electricians.

Most early connectors used in PV installations were single pole types; newer multi-pole connectors increase installation efficiencies even further, multiplying savings. Combining multiple PV panels into one connector instead of using multiple individual connectors allows consolidation of lines, reducing the space needed in an installation. Another advantage is that a user may want to install a multi-pole connector and use one or two positions immediately, leaving room for future expansion in an existing line.

Recently, the author's company was approached by a customer who wanted to take advantage of connector efficiencies, and was specifically seeking connector products that met the pending UL 6703A standard. The company wanted to be proactive because they knew they would be required to meet the standard in the future, and did not want to have to comply after the fact. While they might have been grandfathered in with their existing design, they would eventually have to comply with new standards in effect at the time of any updates or expansions.

To meet the customer's demand, the company opted to go through the process of getting its multi-pole connectors approved under the pending UL 6703A standard. They created samples of their 4-position connector, which is used in AC single-phase applications with micro-inverters and consolidates multiple lines into one connector, significantly saving real estate on installation.

The samples were sent to UL, which performed the tests required and generated a report based on data obtained. UL 6703A approval was received in January 2012; the connector was the first multi-pin and as of press time the only connector to comply with the standard. The connector also met NEC 2008 section 690.33(C) requirements calling for any system greater than 30 volts to have a locking feature that requires a tool to unlock it, as well as the section D requirements for a first make/last break ground. ■

Resources

Fire Fighter Safety and Emergency Response for Solar Power Systems, Final Report, A DHS/Assistance to Firefighter Grants (AFG) Funded Study, Casey C. Grant, P.E.

Fire Protection Research Foundation