Driving Solar Success · RELIABILITY

Sponsored by:

IEC 61730 - The International Standard for Safety of PV Modules
Current Status and UL/ANSI Harmonization Efforts

Christopher Flueckiger and Kenneth P. Boyce

UL LLC

Introduction

IEC 61730-1 and IEC 61730-2, the international standards for Photovoltaic (PV) module safety qualification, were published for the first time in October of 2004.

ANSI/UL 1703, the US National Standard for Safety of Flat-Plate Photovoltaic Modules and Panels, which was first published in August of 1986 and revised as recently as May 2015, has many similar construction and test requirements. However, there are significant differences that necessitate multiple evaluations and certifications to gain global market access for PV modules.

Harmonizing Standards

We are living in a rapidly changing world. With continued globalization and the explosion of photovoltaics, we are becoming more connected every day to people around the globe. Many manufacturers source components in one country, build products in another, and then distribute their products in many others. These products must meet the requirements of multiple countries, and, specifically, multiple safety standards.

The Benefits of Harmonization

Complying with multiple standards can be costly, slow down product launch, result in redundant testing and, if requirements are mutually exclusive or conflicting, may require manufacturing different product models. Conversely, requirements or guidelines comprising different standards that apply to the same industries, devices or initiatives (such as efficient energy use) often overlap.

The goal of harmonization is to find these commonalities, identify critical national requirements that need to be retained, and provide a common standard. For businesses, harmonization cuts compliance costs and simplifies the process of meeting requirements. It also reduces complexity for those tasked with testing and auditing standards compliance.

International Harmonization

Typically, international harmonization involves the adoption of an international standard, such as one published by the IEC (International Electrotechnical Commission) or ISO (International Organization for Standardization). International harmonization can also imply the promotion of UL Standards concepts into existing or new IEC and ISO standards. When support for harmonization of a standard is achieved, then an IEC/ISO-based UL Standard, with appropriate national differences, is developed. UL emphasizes keeping the national differences incorporated in an IEC-based UL Standard to a minimum.

Standards Technical Panel

Standards Technical Panels (STPs) are an important part of the process by which UL develops and maintains its Standards for Safety. An STP is a group of individuals, representing a variety of interests, formed to review proposals related to UL Standards for Safety. When an American National Standards Institute (ANSI)/ UL Standard for Safety is involved, an STP serves as the consensus body to review and vote on proposals prior to publication.

UL Standards

Since 1901, UL has been creating Standards for product safety, with over 1,000 Standards currently available.

Current Status

IEC 61730-1

INTERNATIONAL STANDARD

NORME INTERNATIONALE

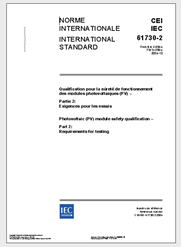
IEC 61730-1, Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction

This part of IEC 61730 describes the fundamental construction requirements for photovoltaic (PV) modules in order to provide safe electrical and mechanical operation during their expected lifetime. Specific topics are provided to assess the prevention of electrical shock, fire hazards, and personal injury due to mechanical and environmental stresses. (Similar to UL 1703)

This standard attempts to define the basic requirements for various application classes of PV modules, (Significant difference from UL 1703) but it cannot be considered to encompass all national or regional building codes. The specific requirements for marine and vehicle applications are not covered. This standard is not applicable to modules with integrated AC inverters (AC modules). (Similar to UL 1703)

The object of this document is to provide basic guidance in certifying the fundamental construction of photovoltaic modules presented for safety approval by testing under IEC 61730-2. These requirements are intended to minimize the misapplication and misuse of modules or the breakdown of internal components which would result in fire, electric shock and personal injury. The standard defines the basic safety construction requirements and additional tests that are a function of the module end-use applications. (Similar to UL 1703, however, adds defined use parameters)

Component requirements are intended to provide evidence of performance of that component appropriate to its application in the module construction and environment. (Similar to UL 1703, but with different component standard references and requirements)


NORME INTERNATIONALE
INTERNATIONAL STANDARD

CEI IEC 61730-2

IEC 61730-2, Photovoltaic (PV) module safety qualification – Part 2: Requirements for testing

This part of IEC 61730 outlines the requirements of testing.

This standard is designed so that its test sequence can coordinate with those of IEC 61215 or IEC 61646, so that a single set of samples may be used to perform both the safety and performance evaluation of a photovoltaic module design. The test-sequences of this standard are arranged in an optimal way so that tests of IEC 61215 or IEC 61646 can be used as basic preconditioning tests. (Significant difference from UL 1703)

The object of this document is to provide the testing sequence intended to verify the safety of PV modules whose construction has been assessed by IEC 61730-1. (Significant difference from UL 1703)

The test sequence and pass criteria are designed to detect the potential breakdown of internal and external components of PV modules that would result in fire, electric shock and personal injury. (Similar to UL 1703)

The standard defines the basic safety test requirements and additional tests that are a function of the module end-use applications. (Significant difference from UL 1703)

Test categories include general inspection (Significant difference from UL 1703), electrical shock hazard, fire hazard, mechanical stress, and environmental stress.

Efforts Underway

The US Standards Technical Panel (STP) for UL 1703, recognizes the benefits for the solar industry that can be achieved by unifying the international and US National standards. Typically, this is accomplished by harmonizing the US National Standard with the International Standard.

In 2005, the first draft harmonization document was presented to the STP for adoption as the new US National Standard for Safety of Photovoltaic Modules and Panels.

The STP determined that the current versions of the IEC 61730 Standards were not yet ready for US adoption, and decided to work with the IEC Working Group (WG2) to draft a new edition of both IEC 61730-1 and IEC 61730-2. The intent was to revise these documents to better align with current US National requirements for PV modules and components while addressing known gaps in the first editions.

This decision was repeated in 2007, 2010, and again in 2012. To facilitate the harmonization, the STP formed a formal International Harmonization Committee (IHC). John Wohlgemuth of NREL and a long-term member of the STP was selected to chair the IHC. The committee voted to continue waiting until the second editions of the IEC 61730 were published.

STP No.	STP Name	Standards Covered	STP Chair	Technical Representative	Project Manager
1703	Flat-Plate Photovoltaic Modules and Panels	**UL 1703** Flat-Plate Photovoltaic Modules and Panels **UL 61215** Crystalline Silicon Terrestrial Photovoltaic (PV) Modules– Design Qualification and Type Approval **UL 61646** Thin-Film Terrestrial Photovoltaic (PV) Modules – Design Qualification and Type Approval	Bradley Schmidt	Christopher Flueckiger	Susan Malohn

To prepare for the eventual harmonization to the second editions of the 61730 standards, the STP voted to adopt the current versions of IEC 61215 and IEC 61646 as is, with no national differences.

In addition, the US National Committee, which represents the US on IEC Technical Committee 82 under the auspices of ANSI, made significant efforts towards providing sound technical comments on the latest draft of the IEC 61730 second edition proposals, which has just achieved unanimous consensus in the vote completed on June 26, 2015.

UL continues to take the lead in the publishing of the second edition of IEC 61730-1 along with an active international writing team. The team is working closely with the development of IEC 61730-2 to ensure that the final adjustments and processing of the proposals happen quickly, with publication likely 1st quarter of 2016.

UL 61215 (IEC 61215:2005)

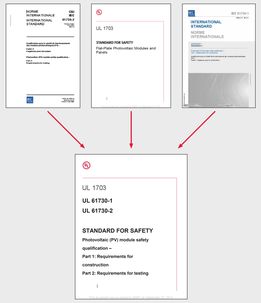
STANDARD FOR SAFETY

Crystalline Silicon Terrestrial Photovoltaic (PV) Modules – Design Qualification and Type Approval

UL 61646 (IEC 61646:2008)

STANDARD FOR SAFETY

Thin-Film Terrestrial Photovoltaic (PV) Modules – Design Qualification and Type Approval



Copyright © 2015 UL LLC. All rights reserved. The Mark Of Ed Logo and Ed Mark™ are trademarks or registered trademarks of UL. LLC. Other Marks and Trademarks are the property of their owners.