



Standard Test Methods for Photovoltaic Modules in Cyclic Temperature and Humidity Environments¹

This standard is issued under the fixed designation E1171; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 These test methods provide procedures for stressing photovoltaic modules in simulated temperature and humidity environments. Environmental testing is used to simulate aging of module materials on an accelerated basis.

1.2 Three individual environmental test procedures are defined by these test methods: a thermal cycling procedure, a humidity-freeze cycling procedure, and an extended duration damp heat procedure. Electrical biasing is utilized during the thermal cycling procedure to simulate stresses that are known to occur in field-deployed modules.

1.3 These test methods define mounting methods for modules undergoing environmental testing, and specify parameters that must be recorded and reported.

1.4 These test methods do not establish pass or fail levels. The determination of acceptable or unacceptable results is beyond the scope of these test methods.

1.5 Any of the individual environmental tests may be performed singly, or may be combined into a test sequence with other environmental or non-environmental tests, or both. Certain pre-conditioning tests such as annealing or light soaking may also be necessary or desirable as part of such a sequence. The determination of any such sequencing and pre-conditioning is beyond the scope of this test method.

1.6 These test procedures are limited in duration and therefore the results of these tests cannot be used to determine photovoltaic module lifetimes.

1.7 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.8 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appro-*

priate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:²

E772 Terminology of Solar Energy Conversion

E1036 Test Methods for Electrical Performance of Nonconcentrator Terrestrial Photovoltaic Modules and Arrays Using Reference Cells

E1462 Test Methods for Insulation Integrity and Ground Path Continuity of Photovoltaic Modules

E1799 Practice for Visual Inspections of Photovoltaic Modules

2.2 IEC Standards:³

IEC 61215 Crystalline Silicon Terrestrial Photovoltaic (PV) Modules — Design Qualification and Type Approval

IEC 61646 Thin-Film Terrestrial Photovoltaic (PV) Modules — Design Qualification and Type Approval

3. Terminology

3.1 *Definitions*—Definitions of terms used in this standard may be found in Terminology **E7721**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *module ground point, n*—the terminal or lead identified by the manufacturer as the grounding point of the module.

4. Significance and Use

4.1 The useful life of photovoltaic modules may depend on their ability to withstand repeated temperature cycling with varying amounts of moisture in the air. These test methods provide procedures for simulating the effects of cyclic temperature and humidity environments. An extended duration damp heat procedure is provided to simulate the effects of long term exposure to high humidity.

¹ These test methods are under the jurisdiction of ASTM Committee **E44** on Solar, Geothermal and Other Alternative Energy Sources and are the direct responsibility of Subcommittee **E44.09** on Photovoltaic Electric Power Conversion.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from International Electrotechnical Commission (IEC), 3 rue de Varembe, Case postale 131, CH-1211, Geneva 20, Switzerland, <http://www.iec.ch>.