



# Standard Practice for Ultraviolet Conditioning of Photovoltaic Modules or Mini- Modules Using a Fluorescent Ultraviolet (UV) Lamp Apparatus<sup>1</sup>

This standard is issued under the fixed designation E3006; 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 This practice covers specific procedures and test conditions for performing ultraviolet conditioning exposures on photovoltaic modules or mini-modules using fluorescent ultraviolet lamps in accordance with Practices [G151](#) and [G154](#). This practice covers test conditions that meet the requirements for UV preconditioning in initial qualification tests of photovoltaic modules or mini-modules as published in International Electrotechnical Commission (IEC) standards.

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

1.3 *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 appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

[E772](#) Terminology of Solar Energy Conversion  
[G113](#) Terminology Relating to Natural and Artificial Weathering Tests of Nonmetallic Materials  
[G130](#) Test Method for Calibration of Narrow- and Broad-Band Ultraviolet Radiometers Using a Spectroradiometer  
[G151](#) Practice for Exposing Nonmetallic Materials in Accelerated Test Devices that Use Laboratory Light Sources  
[G154](#) Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials  
[G177](#) Tables for Reference Solar Ultraviolet Spectral Distributions: Hemispherical on 37° Tilted Surface

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee [E44](#) on Solar, Geothermal and Other Alternative Energy Sources and is the direct responsibility of Subcommittee [E44.09](#) on Photovoltaic Electric Power Conversion.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

### 2.2 IEC Standards:<sup>3</sup>

[IEC 61215](#) Crystalline silicon terrestrial photovoltaic (PV) modules – design qualification and type approval, Second Edition

[IEC 61345](#) UV test for photovoltaic (PV) modules, First Edition

[IEC 61646](#) Thin-film terrestrial photovoltaic (PV) modules – Design qualification and type approval, Edition 2.0

### 2.3 ISO Standards:

[ISO 4892-3](#) Plastics – Method of exposure to laboratory light sources—Part 3: Fluorescent UV lamps

## 3. Terminology

3.1 The definitions given in Terminology [G113](#) and Terminology [E772](#) are applicable to this practice.

## 4. Summary of Practice

4.1 Specimens are exposed to fluorescent ultraviolet lamps of types UVA-340 and UVB-313 as needed to achieve specific dosages of ultraviolet radiation as required by IEC qualification standards for photovoltaic modules and materials or by agreement between contractual parties.

## 5. Significance and Use

5.1 Photovoltaic modules and components must be resistant to prolonged exposure to solar radiation, moisture and heat. Degradation of polymeric components, delamination at the encapsulant and other interfaces, and moisture ingress are among the degradation modes known to decrease the output of photovoltaic modules. IEC qualification standards for PV modules include tests intended to uncover whether solar ultraviolet radiation induced degradation may cause early-life failures. This practice provides general and specific guidance on performing tests that meet the requirements of the ultraviolet radiation conditioning exposures in the IEC qualification

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