



Standard Test Method for Calibration of Primary Non-Concentrator Terrestrial Photovoltaic Reference Cells Using a Tabular Spectrum¹

This standard is issued under the fixed designation E1125; 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 test method is intended for calibration and characterization of primary terrestrial photovoltaic reference cells to a desired reference spectral irradiance distribution, such as Tables G173. The recommended physical requirements for these reference cells are described in Specification E1040. Reference cells are principally used in the determination of the electrical performance of photovoltaic devices.

1.2 Primary photovoltaic reference cells are calibrated in natural sunlight using the relative quantum efficiency of the cell, the relative spectral distribution of the sunlight, and a tabulated reference spectral irradiance distribution. Selection of the reference spectral irradiance distribution is left to the user.

1.3 This test method requires the use of a pyrheliometer that is calibrated according to Test Method E816, which requires the use of a pyrheliometer that is traceable to the World Radiometric Reference (WRR). Therefore, reference cells calibrated according to this test method are traceable to the WRR.

1.4 This test method is used to calibrate primary reference cells; Test Method E1362 may be used to calibrate secondary and non-primary reference cells (these terms are defined in Terminology E772).

1.5 This test method applies only to the calibration of a photovoltaic cell that shows a linear dependence of its short-circuit current on irradiance over its intended range of use, as defined in Test Method E1143.

1.6 This test method applies only to the calibration of a reference cell fabricated with a single photovoltaic junction.

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

2. Referenced Documents

2.1 ASTM Standards:²

- E490 Standard Solar Constant and Zero Air Mass Solar Spectral Irradiance Tables
- E772 Terminology of Solar Energy Conversion
- E816 Test Method for Calibration of Pyrheliometers by Comparison to Reference Pyrheliometers
- E927 Specification for Solar Simulation for Photovoltaic Testing
- E948 Test Method for Electrical Performance of Photovoltaic Cells Using Reference Cells Under Simulated Sunlight
- E973 Test Method for Determination of the Spectral Mismatch Parameter Between a Photovoltaic Device and a Photovoltaic Reference Cell
- E1021 Test Method for Spectral Responsivity Measurements of Photovoltaic Devices
- E1040 Specification for Physical Characteristics of Nonconcentrator Terrestrial Photovoltaic Reference Cells
- E1143 Test Method for Determining the Linearity of a Photovoltaic Device Parameter with Respect To a Test Parameter
- E1362 Test Methods for Calibration of Non-Concentrator Photovoltaic Non-Primary Reference Cells
- E2554 Practice for Estimating and Monitoring the Uncertainty of Test Results of a Test Method Using Control Chart Techniques
- G138 Test Method for Calibration of a Spectroradiometer Using a Standard Source of Irradiance
- G173 Tables for Reference Solar Spectral Irradiances: Direct Normal and Hemispherical on 37° Tilted Surface

¹ This test method 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.

Current edition approved July 1, 2016. Published October 2016. Originally approved in 1986. Last previous edition approved in 2015 as E1125 – 10 (2015). DOI: 10.1520/E1125-16.

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.