



Standard Test Method for Calibration of a Pyranometer Using a Pyrheliometer¹

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INTRODUCTION

Accurate and precise measurements of total global (hemispherical) solar irradiance are required in the assessment of irradiance and radiant exposure in the testing of exposed materials, determination of the energy available to solar collection devices, and assessment of global and hemispherical solar radiation for meteorological purposes.

This test method requires calibrations traceable to the World Radiometric Reference (WRR), which represents the SI units of irradiance. The WRR is determined by a group of selected absolute pyrheliometers maintained by the World Meteorological Organization (WMO) in Davos, Switzerland.

Realization of the WRR in the United States, and other countries, is accomplished by the intercomparison of absolute pyrheliometers with the World Radiometric Group (WRG) through a series of intercomparisons that include the International Pyrheliometric Conferences held every five years in Davos. The intercomparison of absolute pyrheliometers is covered by procedures adopted by WMO and is not covered by this test method.

It should be emphasized that “calibration of a pyranometer” essentially means the transfer of the WRR scale from a pyrheliometer to a pyranometer under specific experimental procedures.

1. Scope

1.1 This test method covers an integration of Test Method E 913 dealing with the calibration of pyranometers with axis vertical and Test Method E 941 on calibration of pyranometers with axis tilted. This amalgamation of the two methods essentially harmonizes the methodology with ISO 9846.

1.2 This test method is applicable to all pyranometers regardless of the radiation receptor employed, and is applicable to pyranometers in horizontal as well as tilted positions.

1.3 This test method is mandatory for the calibration of all secondary standard pyranometers as defined by the World Meteorological Organization (WMO) and ISO 9060, and for any pyranometer used as a reference pyranometer in the transfer of calibration using Test Method E 842.

1.4 Two types of calibrations are covered: Type I calibrations employ a self-calibrating, absolute pyrheliometer, and Type II calibrations employ a secondary reference pyrheliometer as the reference standard (secondary reference pyrheliometers are defined by WMO and ISO 9060).

1.5 Calibrations of reference pyranometers may be performed by a method that makes use of either an altazimuth or

equatorial tracking mount in which the axis of the radiometer’s radiation receptor is aligned with the sun during the shading disk test.

1.6 The determination of the dependence of the calibration factor (calibration function) on variable parameters is called characterization. The characterization of pyranometers is not specifically covered by this method.

1.7 This test method is applicable only to calibration procedures using the sun as the light source.

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:

E 772 Terminology Relating to Solar Energy Conversion²

E 824 Method for Transfer of Calibration from Reference to Field Radiometers³

E 913 Test Method for Calibration of Reference Pyranometers with Axis Vertical by the Shading Method³

¹ This test method is under the jurisdiction of ASTM Committee G-3 on Weathering and Durability and is the direct responsibility of Subcommittee G03.09 on Radiometry.

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² Annual Book of ASTM Standards, Vol 12.02.

³ Annual Book of ASTM Standards, Vol 14.02.