STANDARD 9847

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Solar energy — Calibration of field pyranometers by comparison to a reference pyranometer

Énergie solaire — Étalonnage des pyranomètres de terrain par comparaison à un pyranomètre de référence

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Contents

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 9847 was prepared by Technical Committee ISO/TC 180, *Solar energy*, Sub-Committee SC 1, *Climate -- Measurement and data*.

Annexes A, B, C, D and E of this International Standard are for information only.

Introduction

Accurate and precise measurements of the irradiance of the global (hemispherical) solar radiation are required in

a) the determination of the energy available to flat-plate solar collectors,

b) the assessment of irradiance and radiant exposure in the testing of solar and non-solar-related materials technologies, and

c) the assessment of the direct versus diffuse solar components for energy budget analysis, geographic mapping of solar energy, and as an aid in the determination of the concentration of aerosol and particulate pollution and the effects of water vapour.

Although meteorological and resource assessment measurements generally require pyranometers oriented with their axis vertical, applications associated with flat-plate collectors and the study of the solar exposure of related materials require calibrations of instruments tilted at a predetermined non-vertical orientation. Calibrations at fixed tilt angles have applications which seek state-of-the-art accuracy, requiring corrections for cosine, tilt and azimuth.

Solar energy — Calibration of field pyranometers by comparison to a reference pyranometer

1 Scope

1.1 This International Standard specifies two preferred methods for the calibration of field pyranometers using reference pyranometers.

1.2 One method, the outdoor calibration or type I, employs solar radiation as the source, while the other method, the indoor calibration or type II, employs an artificial radiation source.

1.2.1 The outdoor calibration of field pyranometers may be performed with the pyranometer in a horizontal position (i.e. zero tilt) (type Ia), in a tilted position (type Ib), or at normal incidence (type Ic) maintaining the receiver surface perpendicular to the sun's beam component.

1.2.2 The indoor calibration of field pyranometers may be performed using an integrating sphere with shaded (type IIa) or unshaded (type IIb) lamp(s), or at normal incidence (type IIc) frequently using an optical bench to present the receiver surface perpendicular to the beam of the lamp.

Types IIa and IIb correspond to an outdoor calibration under conditions of overcast and sunny sky with large light cloud fields, respectively. Type IIc is comparable with the normal incidence calibration of type Ic.

1.3 The methods of calibration specified are traceable to the world radiometric reference (WRR); traceability to the International Pyrheliometric Scale of 1956 is not permitted.

1.4 This International Standard is applicable to most types of field pyranometers regardless of the type of radiation receptor employed. In general, all pyranometers used for long-term monitoring of incident solar irradiance may be calibrated by using the described methods, provided that the reference pyranometer has been calibrated at essentially the same tilt from horizontal as the tilt employed in the calibration.

NOTE 1 Pyranometers used for collector tests should be calibrated using a reference pyrheliometer (see ISO 9846).

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 9060:1990, *Solar energy — Specification and classification of instruments for measuring hemispherical solar and direct solar radiation.*

ISO 9846:—[1], *Solar energy — Calibration of a pyranometer using a reference pyrheliometer.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 altazimuth mount: A tracking mount capable of rotation about orthogonal altitude and azimuth axes; tracking may be manual or by a follow-the-sun servomechanism. (See also ISO 9846.)

3.2 global (solar) irradiance: Hemispherical solar irradiance received by a horizontal plane surface. (See also ISO 9060.)

1) To be published.