

This is a preview of "ISO 9845-1:2022". [Click here to purchase the full version from the ANSI store.](#)

Second edition
2022-08

Solar energy — Reference solar spectral irradiance at the ground at different receiving conditions —

Part 1: Direct normal and hemispherical solar irradiance for air mass 1,5

Énergie solaire — Rayonnement solaire spectral de référence au sol sous différentes conditions de réception —

Partie 1: Rayonnement solaire direct normal et hémisphérique pour une masse d'air de 1,5



Reference number
ISO 9845-1:2022(E)

© ISO 2022



COPYRIGHT PROTECTED DOCUMENT

© ISO 2022

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

This is a preview of "ISO 9845-1:2022". [Click here to purchase the full version from the ANSI store.](#)

Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Application of the spectral data for deriving effective solar irradiances and spectrum weighted quantities	2
4.1 Spectrally modified total solar irradiance.....	2
4.2 Solar spectrum weighted property.....	3
4.3 Integrated irradiance.....	3
5 Validation of accuracy	3
6 Reference solar spectral irradiance	4
6.1 SMARTS model code.....	4
6.2 Spectral table.....	4
6.3 Columns in each table.....	4
7 Subordinate solar spectral irradiance	5
Annex A (informative) SMARTS configuration of reference spectra	6
Annex B (informative) Plots of reference solar irradiance	8
Annex C (informative) SMARTS configuration of subordinate spectra	9
Bibliography	11

This is a preview of "ISO 9845-1:2022". Click here to purchase the full version from the ANSI store.

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee 180, *Solar energy*, Subcommittee SC 1, *Climate – Measurement and data*.

This second edition cancels and replaces the first edition (ISO 9845-1:1992), which has been technically revised.

This main changes are as follows:

- the spectral range has been changed to 280 nm to 4 000 nm;
- the spectral resolution has been improved to 2002 wavelengths, the spectra have nonuniform intervals of 0,5 nanometre (nm) between 280 nm and 400 nm, 1 nm between 400 nm and 1 700 nm, 2 nm between 1 700 nm and 1 702 nm, 3 nm between 1 702 nm and 1 705 nm, and 5 nm intervals from 1 705 nm to 4 000 nm;
- the SMARTS (*Simple Model of the Atmospheric Radiative Transfer of Sunshine*) version 2.9.2 (for reference spectra) and 2.9.5 (for subordinate spectra) have been used instead of the BRITE Monte Carlo radiative transfer code. The reference spectra are provided in an .xls file available at <https://standards.iso.org/iso/9845/-1/ed-2/en/>
- 171 subordinate hemispherical spectral irradiances were added, these subordinate hemispherical tilted irradiance spectra for different atmospheric conditions and receiver orientations are provided in an .xls file available at <https://standards.iso.org/iso/9845/-1/ed-2/en/>

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

This is a preview of "ISO 9845-1:2022". [Click here to purchase the full version from the ANSI store.](#)

Introduction

Absorptance, reflectance and transmittance of terrestrial solar energy are important factors in solar thermal system performance, photovoltaic system performance, materials studies, biomass studies and solar simulation activities. These optical properties are normally functions of wavelength, which requires that the spectral distribution of the solar flux be known before the solar weighted property can be calculated. In order to compare the performance of competitive products, a reference standard solar spectral irradiance distribution is desirable.

This document greatly expands the original ISO 9845-1:1992, which provides 2 reference solar spectral irradiance and 171 subordinate solar spectral irradiances. The reference solar spectral distributions include direct normal spectral irradiance with a $5,8^\circ$ field of view centered on the sun and hemispherical solar spectral irradiance on an equator-facing, 37° tilted plane. The subordinate solar spectral distributions include nine atmospheric conditions, 19 tilt angles, and a total of 171 hemispherical irradiance spectra.

Further parts of the standard consider recent improvements in the basic data and modelling techniques leading to better accuracy.