BRITISH STANDARD

BS EN 61345:1998
IEC 61345: 1998

UV test for photovoltaic (PV) modules

The European Standard EN 61345:1998 has the status of a British Standard

ICS 27.160

National foreword

This British Standard is the English language version of EN 61345:1998. It is identical with IEC 61345:1998.

The UK participation in its preparation was entrusted to Technical Committee GEL/82, Solar photovoltaic energy systems, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

From 1 January 1997, all IEC publications have the number 60000 added to the old number. For instance, IEC 27-1 has been renumbered as IEC 60027-1. For a period of time during the change over from one numbering system to the other, publications may contain identifiers from both systems.

Cross-references

Attention is drawn to the fact that CEN and CENELEC Standards normally include an annex which lists normative references to international publications with their corresponding European publications. The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 4, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Amendments issued since publication

Amd. No.	Date	Comments

This British Standard, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on
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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61345

April 1998

ICS 27.160

English version

UV test for photovoltaic (PV) modules

(IEC 61345:1998)

Essai aux rayons ultra-violets des modules photovoltaïques (PV)
(CEI 61345:1998)

Prüfung von photovoltaischen (PV) Modulen mit ultravioletter (UV)-Strahlung
(IEC 61345:1998)

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Ref. No. EN 61345:1998 E

Foreword

The text of document 82/187/FDIS, future edition 1 of IEC 61345, prepared by IEC TC 82, Solar photovoltaic energy systems, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61345 on 1998-04-01.

The following dates were fixed:

— latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1999-01-01

— latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2001-01-01

Annexes designated “normative” are part of the body of the standard.

Annexes designated “informative” are given for information only.

In this standard, Annex ZA is normative and Annex A is informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61345:1998 was approved by CENELEC as a European Standard without any modification.

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1 Scope and object

This International Standard defines a test which determines the resistance of the module when exposed to ultra-violet (UV) radiation. This test is useful for evaluating the UV resistance of materials such as polymers and protective coatings.

The object of this test is to determine the ability of the module to withstand exposure to ultra-violet (UV) radiation from 280 nm to 400 nm. Before conducting this test, light soaking or other pre-conditioning should be performed in accordance with IEC 61215 or IEC 61646.

2 Normative references

The following normative documents 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 normative documents 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 normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60904-1:1987, *Photovoltaic devices — Part 1: Measurements of photovoltaic current-voltage characteristics.*

IEC 60904-3:1989, *Photovoltaic devices — Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data.*

IEC 61215:1993, *Crystalline silicon terrestrial photovoltaic (PV) modules — Design qualification and type approval.*

IEC 61646:1996, *Thin-film terrestrial photovoltaic (PV) modules — Design qualification and type approval.*

3 Initial measurements

The following initial measurements shall be carried out:

— visual inspection in accordance with IEC 61215 or IEC 61646;

— I-V characteristics at standard test conditions (STC) in accordance with IEC 60904-1;

— insulation test in accordance with IEC 61215 or IEC 61646.

4 Apparatus

The apparatus consists of the items listed below.

a) A temperature controlled test chamber or other arrangement with a window or fixtures for a UV light source and the module(s) under test. The chamber shall be capable of maintaining the module temperature at 60 °C ± 5 °C and a dry condition.

b) A UV light source capable of producing UV radiation with an irradiance uniformity of ± 15 % over the test plane of the module(s) and capable of providing the necessary total irradiance in the different spectral regions of interest as defined in clause **5** c). The final test report shall indicate which UV light source is used.

c) Means for measuring and recording the temperature of the module(s) to an accuracy of ± 2 °C. The temperature sensors shall be attached to the front or back surface of the module near the middle. If more than one module is tested simultaneously, it will suffice to monitor the temperature of one representative sample.

d) A calibrated radiometer capable of measuring the irradiance of the UV light produced by the UV light source at the test plane of the module(s).

See Annex A for suggested UV light sources.

5 Procedure

The test shall be carried out according to the procedure outlined below.

a) Use the calibrated radiometer to measure the irradiance at the proposed module test plane and ensure that, at wavelengths between 280 nm and 400 nm, the test spectral irradiance is never more than 5 times the corresponding standard spectral irradiance specified in the standard AM 1,5 solar irradiance distribution given by Table 1 of IEC 60904-3, that there is no appreciable irradiance at wavelengths below 280 nm and that it has a uniformity of ± 15 % over the test plane.

b) Mount the module in the test plane at the location selected in a) with the front side normal to the UV irradiance beam.

c) While maintaining the module temperature within the prescribed range, subject the module(s) to a minimum irradiance of

— 7,5 kWh m^{-2} in the wavelength range between 280 nm and 320 nm, and

— 15 kWh m^{-2} in the wavelength range between 320 nm and 400 nm.

d) Reorient the module so that the back side is normal to the UV irradiance beam.

e) Repeat step c) for 10 % of the time at the irradiation levels that were performed on the front side.

6 Final measurements

Repeat the following tests:

— visual inspection in accordance with IEC 61215 or IEC 61646;

— I-V characteristics at STC in accordance with IEC 60904-1;

— insulation test in accordance with IEC 61215 or IEC 61646.

7 Requirements

The photovoltaic modules tested shall fulfill the requirements stated below.

— No evidence of major visual defects, as defined in IEC 61215 or IEC 61646.

— The degradation of maximum power output at STC shall not exceed 5 % of the value measured before the test. For thin-film modules, the maximum output power at STC shall exceed the manufacturer's minimum power rating for this module type.

— Insulation resistance shall meet the same requirements as for the initial measurements, as defined in IEC 61215 or IEC 61646.

Annex A (informative)
Suggested UV light sources

Selection of a UV light source is based on its ability to meet the spectral requirements of this standard. The following UV light sources can be able to meet these requirements when properly mounted and/or filtered.

A.1 QUV-A and QUV-B fluorescent UV lamps, or similar

QUV-B lamps have a spectral range from 280 nm to 315 nm. The only drawback with this light source is the fact that almost all of the irradiance will be at the high energy end of the specified irradiance range. A combination of QUV-B and QUV-A fluorescent lamps may be used to provide the required irradiation in the specified ranges.

A.2 Filtered xenon

The spectral irradiance of a filtered xenon lamp in the UV-visible range most closely resembles the spectrum of natural sunlight, especially in the wavelengths from 280 nm to 320 nm. Because xenon reproduces all of the solar spectrum, it has more energy in the wavelength bracket ranging from 320 nm to 400 nm than the test specifies. To achieve a total irradiation of 7,5 kWh m^{-2} between 280 nm and 320 nm with a xenon source, the sample may be exposed to considerably more than the 15 kWh m^{-2} of total irradiation specified for the wavelength range between 280 nm and 400 nm.

A.3 UV-high pressure metal halide lamp

These are high pressure mercury discharge lamps with metal halide additives which radiate mainly UVA and UVB. Special quartz glass shall be used to absorb the UVC radiation. This is also important in order to avoid the production of ozone.

A.4 Natural sunlight

Natural sunlight can be utilized with concentration. As with the xenon source, in order to achieve a total irradiation of 7,5 kWh m^{-2} between 280 nm and 320 nm, the sample may be exposed to considerably more than the 15 kWh m^{-2} of total irradiation specified for the wavelength range between 280 nm and 400 nm.

Annex ZA (normative)
Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60904-1	1987	Photovoltaic devices Part 1: Measurement of photovoltaic current-voltage characteristics	EN 60904-1	1993
IEC 60904-3	1989	Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data	EN 60904-3	1993
IEC 61215	1993	Crystalline silicon terrestrial photovoltaic (PV) modules — Design qualification and type approval	EN 61215	1995
IEC 61646	1996	Thin-film terrestrial photovoltaic (PV) modules — Design qualification and type approval	EN 61646	1997

BS EN 61345:1998 IEC 61345: 1998

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