

This is a preview of "BS EN 60904-8-1:2017". [Click here to purchase the full version from the ANSI store.](#)



BSI Standards Publication

Photovoltaic devices

Part 8-1: Measurement of spectral responsivity of multi-junction photovoltaic (PV) devices

This is a preview of "BS EN 60904-8-1:2017". [Click here to purchase the full version from the ANSI store.](#)

National foreword

This British Standard is the UK implementation of EN 60904-8-1:2017. It is identical to IEC 60904-8-1:2017.

The UK participation in its preparation was entrusted to Technical Committee GEL/82, Photovoltaic Energy Systems.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2017
Published by BSI Standards Limited 2017

ISBN 978 0 580 89677 4

ICS 27.160

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 September 2017.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

This is a preview of "BS EN 60904-8-1:2017". [Click here to purchase the full version from the ANSI store.](#)

EUROPÄISCHE NORM

September 2017

ICS 27.160

English Version

Photovoltaic devices -
Part 8-1: Measurement of spectral responsivity
of multi-junction photovoltaic (PV) devices
(IEC 60904-8-1:2017)

Dispositifs photovoltaïques -
Partie 8-1: Mesurage de la sensibilité spectrale
des dispositifs photovoltaïques (PV) multijonctions
(IEC 60904-8-1:2017)

Photovoltaische Einrichtungen -
Teil 8-1: Messen der spektralen Empfindlichkeit von
photovoltaischen (PV) Einrichtungen mit Mehrschichtsolarellen
(IEC 60904-8-1:2017)

This European Standard was approved by CENELEC on 2017-06-22. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

This is a preview of "BS EN 60904-8-1:2017". [Click here to purchase the full version from the ANSI store.](#)

European foreword

The text of document 82/1255/FDIS, future edition 1 of IEC 60904-8-1, prepared by IEC/TC 82 "Solar photovoltaic energy systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60904-8-1:2017.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2018-03-22
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2020-06-22

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 60904-8-1:2017 was approved by CENELEC as a European Standard without any modification.

This is a preview of "BS EN 60904-8-1:2017". [Click here to purchase the full version from the ANSI store.](#)

(normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60904-8	-	Photovoltaic devices - Part 8: Measurement of spectral responsivity of a photovoltaic (PV) device	EN 60904-8	-
IEC 60904-9	-	Photovoltaic devices - Part 9: Solar simulator performance requirements	EN 60904-9	-
IEC/TS 61836	-	Solar photovoltaic energy systems - Terms, definitions and symbols	-	-

This is a preview of "BS EN 60904-8-1:2017". [Click here to purchase the full version from the ANSI store.](#)

This is a preview of "BS EN 60904-8-1:2017". [Click here to purchase the full version from the ANSI store.](#)

CONTENTS

FOREWORD.....	3
1 Scope.....	5
2 Normative references	5
3 Terms and definitions	5
4 General considerations.....	6
5 Bias light	6
6 Bias voltage.....	6
7 Apparatus.....	7
7.1 General.....	7
7.2 Apparatus for measurement of SR using continuous light source	7
7.3 Apparatus for measurement of SR using pulsed light source.....	8
7.4 Apparatus for measurement of series-connected modules.....	8
8 Measurement of SR.....	8
8.1 Measurement of SR using continuous light source	8
8.2 Measurement of SR using pulsed light source.....	8
8.3 Measurement of series-connected modules	8
9 Correction of measured SR.....	8
9.1 General.....	8
9.2 Correction for shunting.....	9
9.3 Correction for luminescent coupling	9
9.3.1 General	9
9.3.2 Correcting the SR of the second junction (for the coupling $J_1 \rightarrow J_2$)	10
9.3.3 Correcting the SR of the third junction (for the coupling $J_1 \rightarrow J_2$ and $J_2 \rightarrow J_3$).....	10
9.3.4 Correcting the SR of the fourth (or higher) junction	11
10 Report	11
Bibliography.....	13

This is a preview of "BS EN 60904-8-1:2017". [Click here to purchase the full version from the ANSI store.](#)

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PHOTOVOLTAIC DEVICES –

Part 8-1: Measurement of spectral responsivity of multi-junction photovoltaic (PV) devices

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60904-8-1 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
82/1255/FDIS	82/1273/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60904 series, published under the general title *Photovoltaic devices*, can be found on the IEC website.

This is a preview of "BS EN 60904-8-1:2017". [Click here to purchase the full version from the ANSI store.](#)

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

PHOTOVOLTAIC DEVICES –

Part 8-1: Measurement of spectral responsivity of multi-junction photovoltaic (PV) devices

1 Scope

This part of IEC 60904 gives guidance for the measurement of the spectral responsivity (SR) of multi-junction photovoltaic devices. It is principally intended for non-concentrating devices, but parts may be applicable also to concentrating multi-junction PV devices. The SR is required for analysis of measured current-voltage characteristics of multi-junction PV devices as described in IEC 60904-1-1.

The requirements for measurement of SR of single-junction PV devices are covered by IEC 60904-8, whereas this document describes the additional requirements for the measurement of SR of multi-junction PV devices. This document only considers the measurement of SR of individual junction layers within a two-terminal multi-junction device.

This document may be applicable to PV devices designed for use under concentrated irradiation if they are measured without the optics for concentration.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60904-8, *Photovoltaic devices – Part 8: Measurement of spectral responsivity of a photovoltaic (PV) device*

IEC 60904-9, *Photovoltaic devices – Part 9: Solar simulator performance requirements*

IEC TS 61836, *Solar photovoltaic energy systems – Terms, definitions and symbols*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC TS 61836 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

current limiting junction

junction in a multi-junction photovoltaic device in which under given illumination conditions the lowest photovoltaic current is generated