ICS 27.160 SLOVENSKÁ TECHNICKÁ NORMA Jún 2017

STN	**Meracie postupy na materiály používané vo fotovoltických moduloch. Časť 1-4: Materiály na zapuzdrenie. Meranie optickej priepustnosti a výpočet váženej (na slnečné žiarenie) priepustnosti pre fotóny, indexu žltnutia a cut-off frekvencie UV žiarenia.**	**STN EN 62788-1-4** 36 4605

Measurement procedures for materials used in photovoltaic modules - Part 1-4: Encapsulants - Measurement of optical transmittance and calculation of the solar-weighted photon transmittance, yellowness index, and UV cut-off wavelength

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 05/17

Obsahuje: EN 62788-1-4:2016, IEC 62788-1-4:2016

124686

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 62788-1-4

December 2016

ICS 27.160

English Version

Measurement procedures for materials used in photovoltaic modules - Part 1-4: Encapsulants - Measurement of optical transmittance and calculation of the solar-weighted photon transmittance, yellowness index, and UV cut-off wavelength (IEC 62788-1-4:2016)

Procédures de mesure des matériaux utilisés dans les modules photovoltaïques - Partie 1-4: Encapsulants - Mesurage du facteur de transmission optique et calcul du facteur de transmission photonique à pondération solaire, de l'indice de jaunissement et de la fréquence de coupure des UV
(IEC 62788-1-4:2016)

Messverfahren für Werkstoffe, die in Photovoltaikmodulen verwendet werden - Teil 1-4: Verkapselungsstoffe - Messung der optischen Transmission und Berechnung der solargewichteten Photonentransmission, des Vergilbungsindex und der UV-Grenzfrequenz
(IEC 62788-1-4:2016)

This European Standard was approved by CENELEC on 2016-11-01. 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, 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

Ref. No. EN 62788-1-4:2016 E

European foreword

The text of document 82/1148/FDIS, future edition 1 of IEC 62788-1-4, prepared by IEC/TC 82 "Solar photovoltaic energy systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62788-1-4:2016.

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)	2017-08-01
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2019-11-01

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

Endorsement notice

The text of the International Standard IEC 62788-1-4:2016 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated :

IEC/TS 61836	NOTE	Harmonized as CLC/TS 61836.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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

Publication	Year	Title	EN/HD	Year
IEC 60904-3	-	Photovoltaic devices - Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data	EN 60904-3	-
ISO 291	2008	Plastics - Standard atmospheres for conditioning and testing	EN ISO 291	2008
ISO 11664-1	2007	Colorimetry - Part 1: CIE standard colorimetric observers	EN ISO 11664-1	2011
ISO 11664-2	2007	Colorimetry - Part 2: CIE standard illuminants	EN ISO 11664-2	2011
ISO 13468-2	1999	Plastics - Determination of the total luminous transmittance of transparent materials - Part 2: Double-beam instrument	EN ISO 13468-2	2006
ISO 17223	2014	Plastics - Determination of yellowness index and change in yellowness index	-	-
ASTM E424-71	2007 [1)]	Standard test methods for solar energy transmittance and reflectance (Terrestrial) of sheet materials	-	-

[1)] Superseded by ASTM E424-71:2015.

IEC 62788-1-4

Edition 1.0 2016-09

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Measurement procedures for materials used in photovoltaic modules – Part 1-4: Encapsulants – Measurement of optical transmittance and calculation of the solar-weighted photon transmittance, yellowness index, and UV cut-off wavelength

Procédures de mesure des matériaux utilisés dans les modules photovoltaïques – Partie 1-4: Encapsulants – Mesurage du facteur de transmission optique et calcul du facteur de transmission photonique à pondération solaire, de l'indice de jaunissement et de la fréquence de coupure des UV

IEC 62788-1-4:2016-09(en-fr)

IEC 62788-1-4

Edition 1.0 2016-09

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Measurement procedures for materials used in photovoltaic modules – Part 1-4: Encapsulants – Measurement of optical transmittance and calculation of the solar-weighted photon transmittance, yellowness index, and UV cut-off wavelength

Procédures de mesure des matériaux utilisés dans les modules photovoltaïques – Partie 1-4: Encapsulants – Mesurage du facteur de transmission optique et calcul du facteur de transmission photonique à pondération solaire, de l'indice de jaunissement et de la fréquence de coupure des UV

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 27.160

ISBN 978-2-8322-3634-5

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

MEASUREMENT PROCEDURES FOR MATERIALS USED IN PHOTOVOLTAIC MODULES –

Part 1-4: Encapsulants – Measurement of optical transmittance and calculation of the solar-weighted photon transmittance, yellowness index, and UV cut-off wavelength

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 62788-1-4 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

The text of this standard is based on the following documents:

FDIS	Report on voting
82/1148/FDIS	82/1165/RVD

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

A list of all parts in the IEC 62788 series, published under the general title *Measurement procedures for materials used in photovoltaic modules*, can be found on the IEC website.

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

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

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

MEASUREMENT PROCEDURES FOR MATERIALS USED IN PHOTOVOLTAIC MODULES –

Part 1-4: Encapsulants – Measurement of optical transmittance and calculation of the solar-weighted photon transmittance, yellowness index, and UV cut-off wavelength

1 Scope

This part of IEC 62788 provides a method for measurement of the optical transmittance of encapsulation materials used in photovoltaic (PV) modules. The standardized measurements in this procedure quantify the expected transmittance of the encapsulation to the PV cell. Subsequent calculation of solar-weighted transmittance allows for comparison between different materials. The results for unweathered material may be used in an encapsulation manufacturer's datasheets, in manufacturer's material or process development, in manufacturing quality control (material acceptance), or applied in the analysis of module performance.

This measurement method can also be used to monitor the performance of encapsulation materials after weathering, to help assess their durability. The standardized measurements are intended to examine an interior region within a PV module, e.g., without the effects of oxygen diffusion around the edges of the cells. Subsequent calculation of yellowness index allows for quantification of durability and consideration of appearance. The change in transmittance, yellowness index, and ultraviolet (UV) cut-off wavelength may be used by encapsulation or module manufacturers to compare the durability of different materials.

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

ISO 291:2008, *Plastics – Standard atmospheres for conditioning and testing*

ISO 11664-1:2007, *Colorimetry – Part 1: CIE standard colorimetric observers*

ISO 11664-2:2007, *Colorimetry – Part 2: CIE standard illuminants*

ISO 13468-2:1999, *Plastics – Determination of the total luminous transmittance of transparent materials – Part 2: Double-beam instrument*

ISO 17223:2014, *Plastics – Determination of yellowness index and change in yellowness index*

ASTM E424-71:2007, *Standard test methods for solar energy transmittance and reflectance (Terrestrial) of sheet material*