

STN	Fotovoltické koncentrátorové systémy (CPV). Skúšanie výkonnosti. Časť 2: Meranie energie.	STN EN 62670-2 36 4650
------------	--	--

Photovoltaic concentrators (CPV) - Performance testing - Part 2: Energy measurement

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. 12/15

Obsahuje: EN 62670-2:2015, IEC 62670-2:2015

122183

Úrad pre normalizáciu, metrológiu a skúšobníctvo SR, 2016
Podľa zákona č. 264/1999 Z. z. v znení neskorších predpisov sa môžu slovenské technické normy
rozmnožovať a rozširovať iba so súhlasom Úradu pre normalizáciu, metrológiu a skúšobníctvo SR.

EUROPEAN STANDARD

EN 62670-2

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2015

ICS 27.160

English Version

**Photovoltaic concentrators (CPV) - Performance testing -
Part 2: Energy measurement
(IEC 62670-2:2015)**

Concentrateurs photovoltaïques (CPV) - Essai de
performances - Partie 2: Mesure de l'énergie
(IEC 62670-2:2015)

Konzentrator-Photovoltaik (CPV) Leistungsmessung -
Teil 2: Energiemessung
(IEC 62670-2:2015)

This European Standard was approved by CENELEC on 2015-06-11. 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

Foreword

The text of document 82/940/FDIS, future edition 1 of IEC 62670-2, prepared by IEC/TC 82 "Solar photovoltaic energy systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62670-2:2015

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) 2016-03-11
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2018-06-11

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 62670-2:2015 was approved by CENELEC as a European Standard without any modification.

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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 62670-1	-	Photovoltaic concentrators (CPV) - Performance testing - Part 1: Standard conditions	EN 62670-1	-
ISO/IEC 17025	-	General requirements for the competence - of testing and calibration laboratories	-	-
ISO 8601	2004	Data elements and interchange formats - Information interchange - Representation of dates and times	-	-
ISO 9060	-	Solar energy; specification and classification of instruments for measuring hemispherical solar and direct solar radiation	-	-
ISO 9847	-	Solar energy - Calibration of field pyranometers by comparison to a reference pyranometer	-	-
JCGM 100	2008	Evaluation of measurement data - Guide to the expression of uncertainty in measurement	-	-



INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Photovoltaic concentrators (CPV) – Performance testing –
Part 2: Energy measurement**

**Concentrateurs photovoltaïques (CPV) – Essai de performances –
Partie 2: Mesure de l'énergie**





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2015 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 60 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

Plus de 60 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.



INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Photovoltaic concentrators (CPV) – Performance testing –
Part 2: Energy measurement**

**Concentrateurs photovoltaïques (CPV) – Essai de performances –
Partie 2: Mesure de l'énergie**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 27.160

ISBN 978-2-8322-2627-8

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	7
4 Description of the method.....	9
5 Selection of subset under test	10
6 Operation, maintenance and cleaning.....	10
7 Downtimes and unavailability.....	11
8 Parasitic energy.....	11
9 Data acquisition.....	11
9.1 General requirements	11
9.1.1 Data acquisition system (DAS)	11
9.1.2 Sampling interval.....	12
9.2 Mandatory measurements.....	13
9.2.1 General	13
9.2.2 Direct normal irradiance.....	13
9.2.3 Global plane of array irradiance.....	13
9.2.4 Ambient air temperature	14
9.2.5 Wind speed	14
9.2.6 Electrical power or energy	14
9.2.7 Cold source temperature (actively cooled systems only).....	14
10 Data post-processing.....	14
10.1 Calculation of energy from integrated power values	14
10.2 Calculation of energy from discrete power values	15
10.3 Calculation of the DNI time series	15
10.4 Calculation of the active AC or DC energy	17
11 Calculation of the performance ratio	18
11.1 General.....	18
11.2 AC performance ratio.....	18
11.3 DC performance ratio.....	19
12 Derived parameters	20
13 Report	20
Annex A (informative) Some suggested ways to filter data in order to identify incorrect data.....	22
Annex B (informative) Best practices for power plant energy measurement.....	23
Annex C (normative) Optionally derived parameters.....	24
C.1 General.....	24
C.2 Energy Production Rate (<i>EPR</i>)	24
C.3 Capacity Factor (<i>CF</i>).....	24
Figure 1 – Nomenclature of angles used in Formula (2)	17

Table 1 – Steps of the energy measurement procedure	10
Table 2 – Mandatory measurements.	13

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**PHOTOVOLTAIC CONCENTRATORS (CPV) –
PERFORMANCE TESTING –****Part 2: Energy measurement****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 62670-2 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
82/940/FDIS	82/969/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.

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

A list of all parts in the IEC 62670 series, published under the general title *Photovoltaic Concentrators (CPV) – Performance testing*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

IEC 62670 series establishes requirements for evaluating concentrator PV performance. It is written to be applicable to all concentrator PV technologies that have a geometric concentration ratio greater than $3\times$ and require tracking.

Included in the IEC 62670 series of standards are definitions of the standard conditions and methods to be used for assessing CPV performance.

IEC 62670-1 defines a standard set of conditions so that power ratings noted on data sheets and nameplates have a standard basis.

IEC 62670-2 describes an on-sun, measurement based method for determining the energy output and performance ratio for CPV arrays, assemblies and power plants.

IEC 62670-3 (under consideration) describes methods for providing a CPV power assessment under a set of standard conditions, enabling assessments both indoors and outdoors.

IEC 62670-4 (under consideration) describes methods for calculating the prospective electrical energy output of CPV modules, arrays, assemblies and power plants based on the measurements carried out in IEC 62670-2.

PHOTOVOLTAIC CONCENTRATORS (CPV) – PERFORMANCE TESTING –

Part 2: Energy measurement

1 Scope

This part of IEC 62670 specifies the minimum requirements for determining the energy output and performance ratio for CPV modules, arrays, assemblies and power plants using an on-sun, measurement based method.

The purpose of this International Standard is to define testing methods, to establish a standard energy measurement for CPV modules, arrays, assemblies and power plants, and to specify the minimum reporting information.

2 Normative references

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.

IEC 62670-1, *Photovoltaic concentrators (CPV) – Performance testing – Part 1: Standard conditions*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO 8601:2004, *Data elements and interchange formats – Information interchange – Representation of dates and times*

ISO 9060, *Solar energy – Specification and classification of instruments for measuring hemispherical solar and direct solar radiation*

ISO 9847, *Solar energy – Calibration of field pyranometers by comparison to a reference pyranometer*

JCGM 100:2008, *Evaluation of measurement data – Guide to the expression of uncertainty in measurement*

koniec náhľadu – text ďalej pokračuje v platenej verzii STN