

**Photovoltaic (PV) module performance testing and
energy rating - Part 1: Irradiance and temperature
performance measurements and power rating**

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61853-1:2011 sisaldab Euroopa standardi EN 61853-1:2011 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 31.03.2011 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

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**Photovoltaic (PV) module performance testing and energy rating -
Part 1: Irradiance and temperature performance measurements and power
rating
(IEC 61853-1:2011)**

Essais de performance et caractéristiques
assignées d'énergie des modules
photovoltaïques (PV) -
Partie 1: Mesures de performance en
fonction de l'éclairement et de la
température, et caractéristiques de
puissance
(CEI 61853-1:2011)

Prüfung des Leistungsverhaltens von
photovoltaischen (PV-)Modulen und
Energiebemessung -
Teil 1: Leistungsmessung in Bezug auf
Bestrahlungsstärke und Temperatur sowie
Leistungsbemessung
(IEC 61853-1:2011)

This European Standard was approved by CENELEC on 2011-03-02. 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.

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CENELEC

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

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Foreword

The text of document 82/613/FDIS, future edition 1 of IEC 61853-1, prepared by IEC TC 82, Solar photovoltaic energy systems, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61853-1 on 2011-03-02.

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

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) 2011-12-02
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2014-03-02

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61853-1:2011 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 referenced documents are indispensable for the application 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 When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60410	-	Sampling plans and procedures for inspection by attributes	-	-
IEC 60891	2009	Photovoltaic devices - Procedures for temperature and irradiance corrections to measured I-V characteristics	EN 60891	2010
IEC 60904-1	-	Photovoltaic devices - Part 1: Measurement of photovoltaic current-voltage characteristics	EN 60904-1	-
IEC 60904-2	-	Photovoltaic devices - Part 2: Requirements for reference solar devices	EN 60904-2	-
IEC 60904-3	-	Photovoltaic devices - Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data	EN 60904-3	-
IEC 60904-5	-	Photovoltaic devices - Part 5: Determination of the equivalent cell temperature (ECT) of photovoltaic (PV) devices by the open-circuit voltage method	EN 60904-5	-
IEC 60904-7	-	Photovoltaic devices - Part 7: Computation of the spectral mismatch correction for measurements of photovoltaic devices	EN 60904-7	-
IEC 60904-9	-	Photovoltaic devices - Part 9: Solar simulator performance requirements	EN 60904-9	-
IEC 60904-10	-	Photovoltaic devices - Part 10: Methods of linearity measurement	EN 60904-10	-
IEC 61215	2005	Crystalline silicon terrestrial photovoltaic (PV) modules - Design qualification and type approval	EN 61215	2005
IEC 61646	2008	Thin-film terrestrial photovoltaic (PV) modules - Design qualification and type approval	EN 61646	2008

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INTRODUCTION

This International Standard series establishes IEC requirements for evaluating PV module performance based on power (watts), energy (watt-hours) and performance ratio (PR). It is written to be applicable to all PV technologies including non-linear devices, but the methodology does not take into account transient behaviour such as light induced changes and/or thermal annealing.

Included in the IEC 61853 series of standards are: a guide to mapping module performance over a wide range of temperature and irradiance conditions; methods for characterising spectral and angular effects; definition of reference climatic profiles (temperature and irradiance); methods for evaluating instantaneous power and energy results; and a method for stating these results in the form of a numerical rating.

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PHOTOVOLTAIC (PV) MODULE PERFORMANCE TESTING AND ENERGY RATING –

Part 1: Irradiance and temperature performance measurements and power rating

1 Scope and object

This part of IEC 61853 describes requirements for evaluating PV module performance in terms of power (watts) rating over a range of irradiances and temperatures. IEC 61853-2 describes test procedures for measuring the performance effect of angle of incidence; the estimation of module temperature from irradiance, ambient temperature and wind speed; and impact of spectral response on energy production. IEC 61853-3 describes the calculations of PV module energy (watt-hours) ratings. IEC 61853-4 describes the standard time periods and weather conditions that can be utilized for calculating standardized energy ratings.

The object of this part of IEC 61853 is to define a testing and rating system, which provides the PV module power (watts) at maximum power operation for a set of defined conditions. A second purpose is to provide a full set of characterization parameters for the module under various values of irradiance and temperature. This set of measurements is required in order to perform the module energy rating described in IEC 61853-3.

2 Normative references

The following referenced documents are indispensable for the application 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 60410, *Sampling plans and procedures for inspection by attributes*

IEC 60891:2009, *Photovoltaic devices – Procedures for temperature and irradiance corrections to measured I-V characteristics*

IEC 60904-1, *Photovoltaic devices – Part 1: Measurement of photovoltaic current-voltage characteristics*

IEC 60904-2, *Photovoltaic devices – Part 2: Requirements for reference solar devices*

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

IEC 60904-5, *Photovoltaic devices – Part 5: Determination of equivalent cell temperature (ECT) of photovoltaic (PV) devices by the open-circuit voltage method*

IEC 60904-7, *Photovoltaic devices – Part 7: Computation of spectral mismatch correction for measurements of photovoltaic devices*

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

IEC 60904-10, *Photovoltaic devices – Part 10: Methods of linearity measurement*

IEC 61215:2005, *Crystalline silicon terrestrial photovoltaic (PV) modules – Design qualification and type approval*

IEC 61646:2008, *Thin film terrestrial photovoltaic (PV) modules – Design qualification and type approval*

3 Sampling

For performance qualification testing three modules shall be selected at random from a production batch or batches in accordance with the procedure given in IEC 60410. The modules shall be pre-conditioned in accordance with Clause 5 to ensure the stability of the power values.

The modules shall have been manufactured from specified materials and components in accordance with the relevant drawings and process sheets and shall have been subjected to the manufacturer's normal inspection, quality control and production acceptance procedures. The modules shall be complete in every detail and shall be accompanied by the manufacturer's handling and final assembly instructions regarding the recommended installation of any diodes, frames, brackets, etc.

When the modules to be tested are prototypes of a new design and not from production, this fact shall be noted in the test report (see Clause 6).

4 Marking

Each module shall carry the following clear and indelible markings:

- name, monogram or symbol of the manufacturer;
- type or model number;
- serial number;
- polarity of terminals or leads (colour coding is permissible);
- nominal and minimum values of maximum output power at STC after preconditioning, as specified by the manufacturer for the product type (see Clause 5).

The date and place of manufacture shall be marked on the module or be traceable from the serial number.

For future production the power ratings for NOCT, LIC, HTC and LTC determined by this standard as defined in Clause 7 and Table 1 and determined via the procedure in 9.2 shall be marked on a label, or be stated in the manufacturer's literature provided with each module of this type.

5 Testing and pass criteria

The modules shall be subjected to the procedure for irradiance and temperature performance measurements defined in Clause 8. In carrying out the tests, the manufacturer's handling, mounting and connection instructions shall be observed.

Special considerations: Preconditioning - Before beginning the measurements, the device under test shall be stabilized by light soaking, as specified in IEC 61215 (Clause 5) or IEC 61646 (10.19).

The values of STC power measured after preconditioning shall fall within the power range specified by the manufacturer of this product.