SLOVENSKI STANDARD
oSIST prEN IEC 62759-1:2021

01-julij-2021

Fotonapetostni (PV) moduli - Preskušanje prevoza - 1. del: Prevoz in dobava pakiranih enot fotonapetostnih modulov

Photovoltaic (PV) modules - Transportation testing - Part 1: Transportation and shipping of module package units

Photovoltaik(PV)-Module - Transportprüfung - Teil 1: Transport und Versand von PV-Modulpaketen

Modules photovoltaïques (PV) - Essais de transport - Partie 1: Transport et expédition d'unités d'emballage de modules

Ta slovenski standard je istoveten z: **prEN IEC 62759-1:2021**

ICS:

03.220.99	Druge oblike transporta	Other forms of transport
27.160	Sončna energija	Solar energy engineering

oSIST prEN IEC 62759-1:2021 **en**

82/1877/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: **IEC 62759-1 ED2**	
DATE OF CIRCULATION: **2021-04-23**	CLOSING DATE FOR VOTING: **2021-07-16**
SUPERSEDES DOCUMENTS: **82/1701/CD, 82/1734A/CC**	

IEC TC 82 : SOLAR PHOTOVOLTAIC ENERGY SYSTEMS

SECRETARIAT: United States of America	SECRETARY: Mr George Kelly
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☒ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING ☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

Attention IEC-CENELEC parallel voting

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Photovoltaic (PV) modules – Transportation testing – Part 1: Transportation and shipping of module package units

PROPOSED STABILITY DATE: 2028

NOTE FROM TC/SC OFFICERS:

This project was discussed and supported by WG2 during their remote meeting in 2020-10.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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PHOTOVOLTAIC (PV) MODULES – TRANSPORTATION TESTING –

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FOREWORD

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International Standard IEC 62759-1 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This second edition of IEC 62759-1 cancels and replaces the first edition of IEC 62759-1, published in 2015; it constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Cancellation of tests and references to relevant standards for CPV.
b) Deletion of different classes for PV modules
c) Deletion of requirement for minimum 10 modules per shipping unit.
d) Implementation of stabilization as intermediate measurement.
e) Addition of pass/fail criteria.
f) Change of requirements for retesting.

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

FDIS	Report on voting
82/XX/FDIS	82/XX/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 of IEC 62759 series, under the general title *Photovoltaic (PV) modules – Transportation 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.

The National Committees are requested to note that for this publication the stability date is ....

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

PHOTOVOLTAIC (PV) MODULES – TRANSPORTATION TESTING –

Part 1: Transportation and shipping of module package units

1 Scope and object

Photovoltaic (PV) modules are electrical devices intended for continuous outdoor exposure during their lifetime. Existing type approval standards do not consider mechanical stresses that may occur during transportation to the PV installation destination.

This part of IEC 62759 describes methods for the simulation of transportation of complete package units of modules and combined subsequent environmental impacts.

This standard is designed so that its test sequence can co-ordinate with those of IEC 61215 so that a single set of samples may be used to perform both the transportation simulation and performance evaluation of a photovoltaic module design.This standard applies to flat plate photovoltaic modules.

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 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-64:2008 +A1: 2019, *Environmental testing – Part 2-64: Tests – Test Fh: Vibration, broadband random and guidance*

IEC 61215:2021 (all parts), *Terrestrial photovoltaic (PV) modules – Design qualification and type approval*

IEC 61730-2:2021, *Photovoltaic (PV) module safety qualification – Part 2: Requirements for testing*

IEC TS 60904-13, *Photovoltaic devices – Part 13: Electroluminescence of photovoltaic modules*

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

IEC TS 62782, *Dynamic mechanical load testing for photovoltaic (PV) modules*

ASTM D880-92, *Standard Test Method for Impact Testing for Shipping Containers and Systems*

ASTM D4169, *Standard Practice for Performance Testing of Shipping Containers and Systems*

ASTM D4728:2006, *Standard Test Method for Random Vibration Testing of Shipping Containers*

ASTM D5277-92, *Test method for performing programmed horizontal impact using an incline impact tester*

ISTA 3E:2009, *Unitized Loads of Same Product*

MIL STD 810G, *Test Method Standard for Environmental Engineering Considerations and Laboratory Tests*

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
bandwidth
difference in Hz between the upper and lower limits of a frequency band. For the purposes of the described test method, the bandwidth may be considered equivalent to the frequency resolution of a spectrum analysis

3.2
overall g_{RMS}
square root of the integral of power spectral density over the total frequency range. It describes the severity or harshness of the testing grade

3.3
root mean square
r.m.s.
square root of the mean square value. In the exclusive case of a sine wave, the r.m.s. value is 0,707 times peak value

3.4
random vibration
oscillation whose instantaneous amplitude is not prescribed for any given instant in time. The instantaneous amplitudes of a random vibration are prescribed by a probability distribution function, the integral of which, over a given amplitude range, will give the probable percentage of time that the amplitude will fall within that range. Random vibration contains no periodic or quasi-periodic components

3.5
packaging
material and technology used to protect goods from transportation stresses and separate individual units from each other

3.6
power spectral density
PSD
expression of random vibration in terms of mean-square acceleration per unit of frequency. The units are g^2/Hz (g^2/cycles/s). Power spectral density is the limit of the mean square amplitude in a given rectangular waveband divided by the bandwidth, as the bandwidth approaches zero

4 Sampling

As test samples for the basic transportation and shock test methods, a shipping unit of PV modules, shall be taken at random from a production batch or batches. The shipping unit shall contain the usual amount of PV modules.

Further three PV modules are to be taken from a separate shipping unit not undergoing any transportation simulation.

Use the regular shipment packaging materials with the modules, as marketed and designed by the manufacturer.

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, including a type label and shall be accompanied by the manufacturer's handling, mounting, shipping/packaging and installation instructions, including the information of the maximum permissible system voltage.

The shipping unit of test specimen shall be in accordance with the standard procedures used to ship modules to customers.

5 Handling

The test samples shall be handled with suitable care prior to the application of the tests described in this standard. It shall be ensured that the test samples are not exposed to additional mechanical impacts in form of shocks, rough handling, dropping, etc.

For the transportation from the manufacturer to the test laboratory special care should be taken to avoid any kind of damage. A special packaging concept may be considered for this particular shipping route (manufacturer – test site). Testing shall be carried out without additional packaging.

6 Testing procedures

6.1 General

Performance measurements, visual inspection, insulation and wet leakage current testing shall be performed in accordance with IEC 61215-2:2021, MQT 01, MQT 02, and in accordance with IEC 61730:2021, MST 16 and MST 17 as reference initial and control measurements.

Electroluminescence images according to IEC 60904-13 shall be used to support the evaluation of the samples initial and intermediate status (e. g. micro cracks, defects, etc.)

The actual transportation test is shown in Figure 1. The sequences of combined transportation stress testing and the possible effects of these impacts on the PV modules shall detect early failures in regards to future life-time stresses.

If a manufacturer wishes to combine the testing to this standard with type approval testing, sequence A of Figure 1 can also be used in conjunction with IEC 61215 testing. Combined testing will increase the risk of failure in type approval testing, as the transportation testing will pose additional stress to the samples.

Sequence B of Figure 1 could be extended with the UV preconditioning test and then also be coordinated with IEC 61215.

Separate modules, that have not undergone any transportation testing, are also subjected to the stress tests in sequences A and B. Failures induced by the transportation simulation and potentially worsen defects due to the environmental stress tests shall be identified in comparison to the modules tested without any transportation pre-damages.

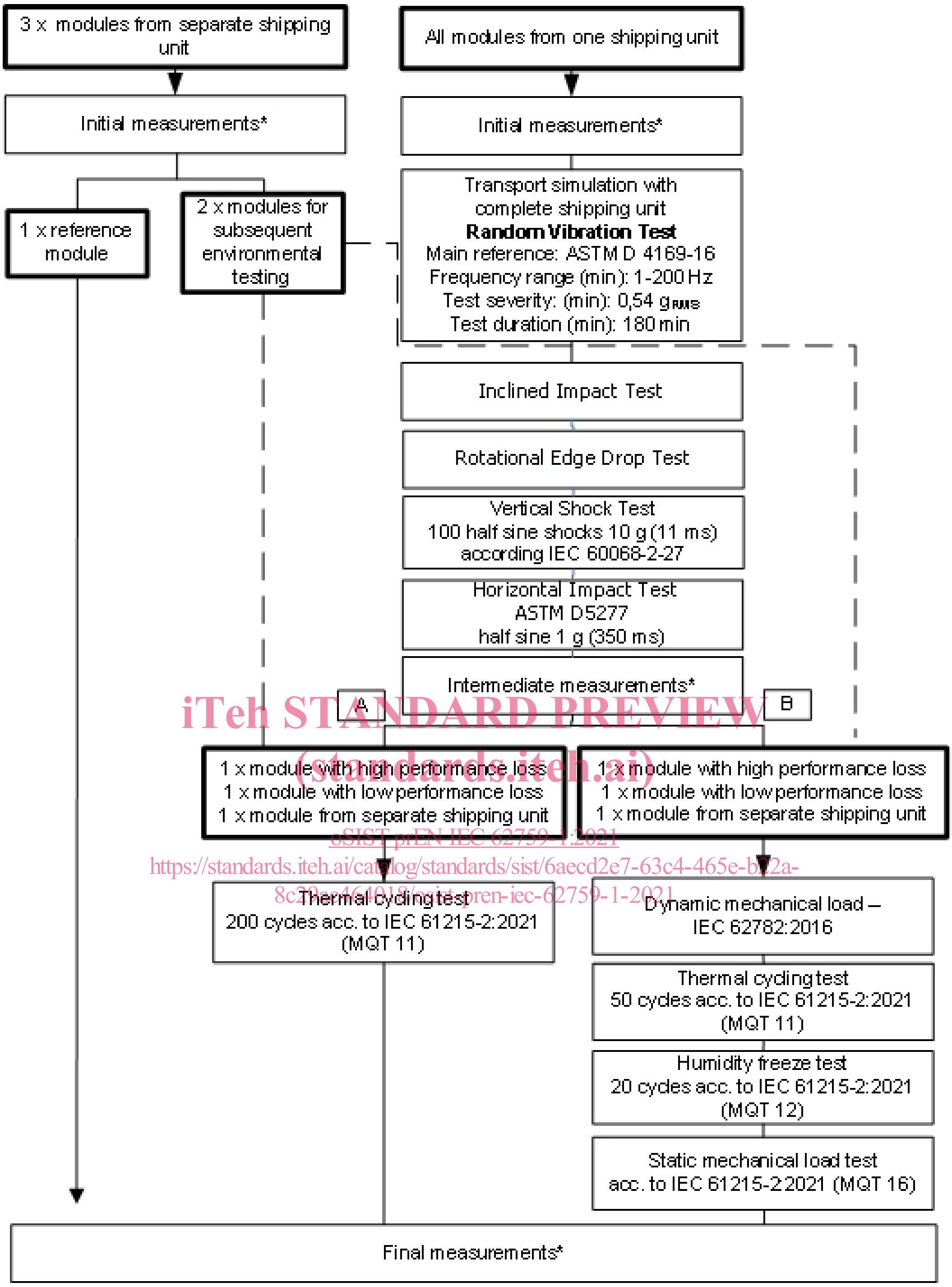

Figure 1 – Test sequences for PV modules

*See 6.2 for details on measurements.