SLOVENSKI STANDARD
SIST EN 62817:2015/A1:2018

01-januar-2018

Sledilniki sonca za fotonapetostne sisteme - Ocena zasnove - Dopolnilo A1

Photovoltaic systems - Design qualification of solar trackers

Sonnen-Nachführeinrichtungen für photovoltaische Systeme - Bauarteignung

Systèmes photovoltaïques - Qualification de conception des suiveurs solaires

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27.160	Sončna energija	Solar energy engineering

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English Version

Photovoltaic systems - Design qualification of solar trackers (IEC 62817:2014/A1:2017)

Systèmes photovoltaïques - Qualification de conception des suiveurs solaires (IEC 62817:2014/A1:2017)

Sonnen-Nachführeinrichtungen für photovoltaische Systeme - Bauarteignung (IEC 62817:2014/A1:2017)

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

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European foreword

The text of document 82/1018/CDV, future edition 1 of IEC 62817:2014/A1:2017, prepared by IEC/TC 82 "Solar photovoltaic energy systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62817:2015/A1:2017.

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2018-06-01
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2020-09-01

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The text of the International Standard IEC 62817:2014/A1:2017 was approved by CENELEC as a European Standard without any modification.

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

Photovoltaic systems – Design qualification of solar trackers

Systèmes photovoltaïques – Qualification de conception des suiveurs solaires

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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FOREWORD

This amendment has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

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

CDV	Report on voting
82/1018/CDV	82/1097/RVC

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

The committee has decided that the contents of this amendment and the base 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.

7.3.3 Calibration of pointing error measurement tool

Add the following to 7.3.3

A procedure for calibration of pointing error measurement tool does not exist in this or any other IEC document. It is recommended that the pointing error measurement tool be calibrated at least once per year per the following:

Outdoor tracker pointing error sensor calibration procedure:

Apparatus and measurement requirements: Device for mounting and orienting the pointing error sensor (typically a solar tracker but other devices suffice), data acquisition system capable of measuring outputs of the pointing error sensor, recording the timestamp that is accurate to the true time within 2 s, visual verification of no clouds impinging the view of the sun during the entire measurement period (including thin cirrus clouds) or verification during the entire measurement period that the DNI varies no more than 2 % from maximum to minimum values recorded.

a) Determine the measurement range for which the calibration is desired. The maximum measurement range is the field of view of the sensor under calibration but a smaller measurement range can be used as applicable to the calibration.

b) Assume that ±1° is the measurement range for the calibration. Mount the sensor on the alignment device and adjust the position of the device so that the sensor is pointing approximately 1° (or other determined measurement range) ahead of the sun’s movement path in both axes of orientation. If the alignment device is a solar tracker, this means aligning the sensor with the solar tracker’s mounting plane and then moving the solar tracker 1° ahead of the sun's position (in both axes). Fix the position of the alignment device (this means stopping movement of a solar tracker).

c) Start the data acquisition, recording both the timestamp and outputs of the pointing error sensor at a 10 s or shorter interval. Record data for the time period it takes for the sun to walk through the desired measurement range for each axis under calibration (for this example this is 2° of sun movement for the ±1° measurement range). The time necessary for the sun to move the desired range depends on the latitude/longitude of the measurement location, the day of the year, and the time of day. Input this information into the Solpos or SPA algorithms for determining sun location during the test period (freely available at http://www.nrel.gov/midc/srrl_bms/).

d) After completion of the data acquisition period, using the timestamp from the dataset, merge sun position data from the Solpos or SPA algorithms for both solar zenith and solar azimuth angle into the measured data set. Determine the solar zenith and azimuth positions for which the outputs of each axis of the pointing sensor correspond to zero pointing error (For most sensor designs this corresponds to a zero voltage output signal). Data points can be interpolated between to find the zero pointing error position. These azimuth and zenith positions should be recorded as the "fixed azimuth" and "fixed zenith" pointing position of the sensor for the calibration period.

e) Calculate the true azimuth and zenith pointing error for every data point in the data set as follows:

$$\textit{True Zenith Pointing Error} = \textit{Zenith}_{\textit{Solpos}} - \textit{Zenith}_{\textit{FixedPosition}}$$

$$\textit{True Azimuth Pointing Error} = (\textit{Azimuth}_{\textit{Solpos}} - \textit{Azimuth}_{\textit{FixedPosition}})\cdot \textit{Sine}(\textit{Zenith}_{\textit{Solpos}})$$

Note that the *True Azimuth Pointing Error* is an approximation which is only valid as $(\textit{Azimuth}_{\textit{Solpos}} - \textit{Azimuth}_{\textit{FixedPosition}})$ approaches 0. For cases where values of $(\textit{Azimuth}_{\textit{Solpos}} - \textit{Azimuth}_{\textit{FixedPosition}})$ are less than 5 and where $\textit{Zenith}_{\textit{Solpos}}$ is more than 3, the error of the approximation is less than 0,0001°. Generally speaking achieving the conditions for such low error is achievable.

f) Plot the *True Zenith Pointing Error* against the corresponding sensor output for the zenith axis. The sensor manufacturer shall establish the details of the final output signal to be used for the calibration plots as some sensors have a single signal while others that have multiple signals that together are used for determining the measured pointing error. Plot the *True Azimuth Pointing Error* against the corresponding sensor output for the azimuth axis. For both plots apply a linear fit to the data set. Report the fit coefficients and the standard deviation of the slope. The slope is the calibration factor between the output signal and the pointing error in degrees. Note that the calibration procedure presented here is a relative measurement of the sensor's ability to represent a change in pointing error with a change in its output and does not prove absolute pointing error. Also, the calibration procedure is described in terms of azimuth and zenith as this relates to the Solpos and SPA algorithms but the calibration coefficients apply to the two generic axes of the sensor that can be mounted on various tracker configurations.

8.4.4 Torsional stiffness, mechanical drift, drive torque, and backlash testing

8.4.4.2 Procedure, paragraph preceding Option a)

In this paragraph, replace the last three sentences with the following text:

Assuming the tracker has a horizontal stow position, the stow moment coefficient derived from third-party wind tunnel or field test data shall be for the tracker in a position 3° from horizontal. This deviation from horizontal accounts for potential deviations from stow to the true horizontal position and for minor variations in ground slope in otherwise flat areas. Wind tunnel testing shall demonstrate establishment of a representative atmospheric boundary layer which includes turbulence that accounts for the normal deviations in wind flow from purely horizontal. Wind tunnel data shall be collected at the 3° tilt position, unless the said tracker cannot achieve this position. In such an event, the wind tunnel testing and derivation of the moment coefficient shall be performed at the nearest position to horizontal that the tracker can achieve.

NOTE The tilt position for extreme moment testing was changed from 10° to 3°, as the original 10° was deemed overly conservative. Appropriate wind tunnel atmospheric boundary layers already account for deviations from horizontal wind flows which the 10° was originally claimed to take into account.

8.5 Environmental testing

8.5.2 Procedure

Replace the existing item a) with the following new item a):

a) Temperature cycle (no humidity added to the air) where inclusion of dust is recommended as follows but is not required: at least 40 cycles and 480 h shall be completed. The maximum temperature shall be 55 °C and the minimum temperature shall be –20 °C. If the operational temperature range specified in Table 1 (see 6.12.1) indicates the tracker can operate outside –20 °C to 55 °C, then the temperature range of this test shall be expanded to coincide with the specified values. In other words, –20 °C to 55 °C can be considered the minimum test conditions, but more extreme values shall be applied to align with the specification sheet. The cycle shall dwell for at least 5 min, but not more than 15 min, at ±3 °C of the maximum and minimum temperatures per average surface temperature measurements at three distinct points on the drive train. The temperature measurement points shall be documented and have justification supporting that surface measurements are on an object with significant thermal mass in relation to the system under test. For the first 240 h, dust should be circulated around the dynamic mechanical interfaces of the drive train. When dust is included in the test, A4 dust per ISO 1203-1 shall be used (contains distribution of both fine and coarse particles). A temporary structure can be used to contain the region of circulating dust, as opposed to circulating dust in the entire environmental chamber. A blower or other mechanism shall be used to ensure that dust is circulating in the air. Because dust will settle and collect on surfaces, it may be necessary to periodically add additional dust to the blower system through the course of the 240 h. Video, photographs, or other methods shall document that dust is visible in the air at 10 min intervals throughout the test. An alternate option is to complete the 240 h of dust testing at a steady temperature after the onset of the 480 h of temperature cycling. The combination of the dust and temperature cycling is recommended because it shortens test time and because temperature cycles can cause expansion and contraction of seals and other parts that may enhance the ability for dust to penetrate into places that can ultimately lead to failure. The alternate option is provided, because facilities may not be readily available that can combine both tests, or such a test could be prohibitively expensive. The test report shall clearly indicate if dust testing was or was not completed.