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Zahteve za označevanje in dokumentacijo fotonapetostnih modulov

Marking and documentation requirements for Photovoltaic Modules

Datenblatt- und Typenschildangaben von Photovoltaik-Modulen

Exigences de marquage et de documentation des modules photovoltaïques
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Datenblatt- und Typenschildangaben von Photovoltaik-Modulen

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European foreword

This document (EN 50380:2017) has been prepared by CLC/TC 82 “Solar photovoltaic energy systems”.

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) 2018-07-17
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2020-07-17

This document supersedes EN 50380:2003.

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EN 50380:2017 (E)**1 Scope**

This European Standard describes marking, including nameplate and documentation requirements for non-concentrating photovoltaic modules.

This European Standard provides mandatory information that needs to be included in the product documentation or affixed to the product to ensure safe and proper use. Best practices are included in this document giving guidance on additional information, for example module's performance at different irradiance levels.

Markings, including nameplates, are permanently affixed information on the PV modules, which indelibly states the rating and other information as required by the relevant standard for safe use and maintenance. While, documentation information is a technical description separate from the photovoltaic module.

This European Standard is based on IEC and EN standards defining marking, nameplate and documentation requirements for PV 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.

EN 13501-1, *Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests*

EN 45011, *General requirements for bodies operating product certification systems (ISO/IEC Guide 65)*

EN 50618, *Electric cables for photovoltaic systems*

EN 60529, *Degrees of protection provided by enclosures (IP Code) (IEC 60529)*

EN 60904-10, *Photovoltaic devices - Part 10: Methods of linearity measurement (IEC 60904-10)*

prEN 61730-1:2015, *Photovoltaic (PV) module safety qualification - Part 1: Requirements for construction (IEC/CDV 61730-1:2015)*

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

CLC/TS 61836, *Solar photovoltaic energy systems - Terms, definitions and symbols (IEC/TS 61836)*

EN 62790, *Junction boxes for photovoltaic modules - Safety requirements and tests (IEC 62790)*

EN 62852, *Connectors for DC-application in photovoltaic systems - Safety requirements and tests (IEC 62852)*

IEC 60050, *International Electrotechnical Vocabulary*

IEC 61215 (all parts), *Terrestrial Photovoltaic (PV) Modules – Design Qualification and Type Approval*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CLC/TS 61836, IEC 60050 and the following apply.

3.1

documentation

information provided by the manufacturer to allow satisfactory understanding, installation and safe use of the module

Note 1 to entry: Typically documentation is provided by manufacturer as user manual and data-sheet.

3.2

marking

permanently affixed information on an electric device, herein the PV module, which indelibly states the rating and other information as required by the relevant standard for safe use and maintenance

3.3

standard test conditions

STC

1 000 W/m², 25 °C, AM 1,5G (EN 60904-3)

Note 1 to entry: As defined in CLC/TS 61836.

3.4

nominal module operating temperature

NMOT

equilibrium mean photovoltaic cell junction temperature within an open-rack mounted module operating near peak power in the following standard reference environment (SRE)

Note 1 to entry: Determination procedure is explained in detail in MQT 05 of IEC 61215-2 and EN 61853-2.
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- tilt angle: 37,5° ± 2,5° from the horizontal;
- total irradiance: 800 W/m²;
- ambient temperature: 20 °C;
- wind speed: 1 m/s;
- electrical load: A resistive load sized or maximum power point tracking (mppt) device such that the module will operate near maximum power point.

3.5

limited reverse current

I_R

current carrying capacity which gives the maximal current for operation of photovoltaic module at a working voltage $V \geq V_{oc}$ without permanent damages of the photovoltaic module

Note 1 to entry: For working voltages higher than open circuit voltage module, the current changes its algebraic sign (math. ±). This current is therefore a reverse current to the photovoltaic module.

3.6

nameplate

plate, permanently affixed on an electric device, which indelibly states the rating and other information as required by the relevant standard

[SOURCE: IEC 151-16-12]

EN 50380:2017 (E)**3.7****rated production tolerances**

value specified by the manufacturer that characterize the normal production tolerances at STC

Note 1 to entry: This is not the binning into power classes.

3.8**stabilized parameters**

electrical parameters that characterize the device in its stabilized state where it is usually operated

Note 1 to entry: For stabilization procedure and requirements see MQT 19 of IEC 61215–2. Stabilization can be achieved by light exposure or other validated method per IEC 61215–2.

3.9**initial parameters**

electrical parameters that characterize the device in its initial state directly after production

3.10**electrical characteristics**

P_{mpp} Power at maximum power point

P_{max} Maximum power at STC condition

V_{oc} Open circuit voltage at STC condition

I_{sc} Short circuit current at STC condition

V_{Pmax} Voltage at maximum power point at STC condition

I_{Pmax} Current at maximum power point at STC condition

V_{sys} Maximum system voltage

OCP_{max} Maximum overcurrent protection rating

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3.11**rated current of overcurrent protection (OCP) device**

current rating of fuse or circuit breaker according to EN 60269-6

4 Documentation information**4.1 General**

Modules shall be supplied with documentation describing the methods of electrical and mechanical installation as well as the electrical ratings of the module. The documentation shall state the Class under which the PV module was qualified and any specific limitations required for that Class. The documentation shall state the environmental conditions to which the module has been qualified. It shall be ensured that appropriate documentation for safe installation, use, and maintenance are available to installers and operators.

The documentation of a PV module typically consists of a user manual and a data-sheet. The user manual/general documentation shall contain all information to comply with national legal product requirements. Extra requirements may apply. Summarized information in addition to the user manual is typically stated in a data-sheet but could also be directly part of the user manual.

For identical PV modules it is considered to be sufficient that one set of documentation is supplied with the PV module shipping unit.

International symbols shall be used where applicable.

4.2 Documentation language

Documentation required by this standard shall be written in an official language of the country in which the PV module is installed.

4.3 Mandatory information

4.3.1 General

This subclause lists the mandatory information to be provided for PV modules according to this standard.

4.3.2 Electrical, including wiring, information

The documentation shall contain the following electrical information:

- a) polarity of terminals or leads;
- b) "Maximum system voltage" or V_{sys} ;
- c) Maximum overcurrent protection (OCP) rating

Overcurrent protection devices with a 1hr, 1,35 I_R overload rating, where I_R is the rated value of the overcurrent protection device, are recommended.

NOTE Compliance can be checked according to EN 61730-2 MST 26. I_R -rating can be determined using procedure in Annex A.

- d) Class of protection against electrical shock, in accordance with EN 61730-1 (see further details in 5.2.3 f))

The following electrical data shall be shown as relative to standard test conditions (1 000 W/m², 25 °C, AM 1,5G according to CLC/TS 61836) and after stabilization. Manufacturer's stated rated production tolerance shall be given also under standard test conditions (STC).

- e) "Voltage at open-circuit" or " V_{oc} " including rated production tolerance
- f) "Voltage at maximum power point" or " V_{Pmax} " including rated production tolerance
- g) "Current at maximum power point"; or " I_{Pmax} " including rated production tolerance
- h) "PV module maximum power" or " P_{max} " including rated production tolerance
- i) "Current at short-circuit"; or " I_{sc} " including rated production tolerance

Electrical values after stabilization according to the IEC 61215 series shall be verifiable and within the specified rated production tolerances and uncertainties. A procedure is given in Annex B

NOTE 1 Example: $P_{\text{max}} = 250,0$ W, rated production tolerance 3 %, binning + 5 W / - 0 W. That means that modules from 250,0 W to 254,9 W are sorted in one bin, rated $P_{\text{max}} = 250,0$ W. Tolerance of 3 % results on deviations from 250,0 W from 242,5 W to 257,5 W.

If initial values differ by more than the manufacturer's stated production tolerances from stabilized values this shall be stated separately.

At the example of an a-Si type module with an initial degradation of 20 % and a rated production tolerance of 5 %, I_{sc} and V_{oc} have to be stated as initial and stabilized parameters.

If output of module (I_{sc} , V_{oc} and P_{max}) is site or mounting means dependent (e.g. due to back side illumination of bifacial cells) variability and maximal output (I_{sc} , V_{oc} and P_{max}) shall be stated.

- j) Relative temperature coefficients in [%/K] for I_{sc} , P_{max} and V_{oc} at STC

NOTE 2 The values for I_{MPP} and V_{MPP} can be provided.

- k) State if temperature coefficients are linear. In cases of nonlinear temperature coefficients according to EN 60904-10 further information regarding temperature coefficients shall be provided.

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The electrical documentation shall include a detailed description of the electrical installation wiring method to be used. This description shall include:

- l) The minimum cable diameters for PV modules intended for field wiring
- m) Any limitations on wiring methods and wire management that apply to the junction box for the PV module
- n) The size, type, material, and temperature rating of the conductors to be used
- o) Type of terminals for field wiring
- p) Specific PV connector model/types and manufacturer to which the PV module connectors can be mated
- q) The bonding method(s) to be used (if applicable) shall be specified. All provided or specified hardware shall be identified in the documentation;
- r) A statement if protective devices (e.g. bypass diode etc.) are part of the PV module. A statement if the protective device is replaceable.

To facilitate proper system sizing the manufacturer shall include relevant parameters in the documentation that allow system layout based not only on STC values given in the documentation. For example a safety factor for V_{oc} and I_{sc} of 1,25 is recommended since irradiance is often higher than 1 000 W/m² and temperature below 25 °C may raise V_{oc} .

The following or equivalent statement shall be included:

“Under normal conditions, a photovoltaic module is likely to experience conditions that produce higher current and/or voltage than reported at standard test conditions. Accordingly, the values of I_{sc} and V_{oc} marked on this PV module should be multiplied by a factor of 1,25 when determining component voltage ratings, conductor current ratings, and size of controls (e.g. inverter) connected to the PV output.”

The safety factor of 1,25 for the minimum voltage rating of the components can be modified during the design of a system according to the minimum temperature of the location of the installation and the temperature coefficient for V_{oc} . I_{sc} can be adjusted based on maximal temperature, irradiance and orientation of the module. To this end a full simulation for the specific location is required using long term weather data.

A statement indicating the maximum altitude the PV module is designed for. Electrical de-ratings applied in accordance to EN 61730-1. Voltage de-rating as specified in the insulation coordination can be applied.

4.3.3 Mechanical information

- a) A statement indicating the design load for each mounting method (clamps, bolts, etc.) for securing the module.
- b) Limitations for each mounting method (slope, mounting means, air gap between structure and module, rack mounting, roof or building integrated / attached, etc.).
- c) Limitations for each mounting method if fire rating is dependent on mounting method.

4.3.4 Installation information

4.3.4.1 General

- a) Assembly information and instructions shall be provided with a product shipped in subassemblies, and shall be detailed and adequate to the degree required to facilitate complete and safe assembly of the product.
- b) The documentation shall include a statement advising that external or otherwise artificially concentrated sunlight shall not be directed onto the front or back face of the PV module (if not qualified for).

4.3.4.2 Constructive characteristics

- a) Mounting position (e.g. holes or position of clamps). Details for mounting are given in 4.3.3.
- b) Equipotential bonding position.
- c) Weight in kg.

4.3.5 Certificates

All relevant certificates (according to EN 45011) for safe installation and use shall be listed in the documentation.

4.3.6 Other information

None.

4.4 Best practice information

4.4.1 Electrical, including wiring, information

- a) Nominal module operating temperature – NMOT.
- b) Performance at NMOT (MQT 06.2).
- c) Performance at low irradiance (MQT 07).
- d) Relative temperature coefficients in [%/K] for I_{sc} , P_{max} and V_{oc} at 200 W/m² or others irradiance levels.

NOTE The values for I_{MPP} and V_{MPP} can be provided.

- e) The number of maximum series and parallel PV module in a string configurations.
- f) Information as per Annex C for energy yield calculation.
- g) Information on module insulation behaviour as function of environment as per C.3.
- h) Information of PV modules capacitance as per C.4.

4.4.2 Mechanical information

None.

4.4.3 Installation information — Constructive characteristics

- a) Technical drawing with number of cells and bypass diode (type and ratings) circuit as applicable;
- b) outer dimensions (length, width) of the photovoltaic module;