IEC 62920

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
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Photovoltaic power generating systems – EMC requirements and test methods for power conversion equipment

Systèmes de production d'énergie photovoltaïque – Exigences de CEM et méthodes d'essai pour les équipements de conversion de puissance

IEC 62920:2017-07/AMD1:2021-04(en-fr)

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Photovoltaic power generating systems – EMC requirements and test methods for power conversion equipment

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 27.160

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FOREWORD

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

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

FDIS	Report on voting
82/1835/FDIS	82/1874/RVD

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

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

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- withdrawn,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.

INTRODUCTION

Replace the existing text of the Introduction with the following:

Background

Power conversion equipment (PCE) is indispensable for solar photovoltaic power energy systems in order to convert the DC electric power energy generated by solar photovoltaic panels into AC or DC electric power, and to feed the AC power energy into the AC mains network or loads. PCE consists of DC to DC, DC to AC or AC to DC converters and forms systems with or without DC-coupled electrical energy storage devices.

Manufacturers of PCE ensure the performance and reliability of PCE. Electromagnetic compatibility (EMC) is one aspect of performance which must be ensured wherever PCE is used in or exposed to an electromagnetic environment.

IEC Guide 107 specifies that TC 77 and CISPR, which are called EMC committees, have responsibility for the development of basic, product family and generic standards on EMC requirements, and product committees must use the emission limits developed by EMC committees and must refer to basic immunity standards for the specification of test techniques.

However, when the EMC standards which are developed by TC 77 and CISPR are not considered suitable for a particular product or electromagnetic environment, product committees must seek their assistance and advice for any change in the emission limits and/or measurement requirements. Product committees are responsible for selecting the appropriate immunity test items and levels for their products as well as for defining the relevant performance criteria for the evaluation of the immunity test results. Consequently, product committees, such as TC 22, TC 26, TC 9, and TC 69, have their own EMC standard to define EMC requirements and test methods for their particular types of products.

TC 82 also has the responsibility to consider EMC requirements for PCE applying to the solar photovoltaic power energy systems, and TC 82 has taken action as follows to develop its own product EMC standards:

a) selection of the immunity test items in accordance with EMC environments for the solar photovoltaic power energy systems,

b) supplement of generic standards with a detailed description of test conditions and test set up,

c) development of the conditional limits and alternative test methods in terms of installation environmental and operational conditions, and

d) development of appropriate requirements and test method for high power equipment.

In 2017, TC82 published IEC 62920 (Ed.1.0). By taking into account the latest market needs, IEC 62920:2017 (Ed.1.0) has covered the above mentioned items and presents the minimum EMC requirements for PCE applying to solar photovoltaic power energy systems.

Purpose of the maintenance of a product EMC standard

Following the state of the art technology as well as the latest market needs, users of standards recognize the improvement of product EMC standards. The maintenance of product standards is also one of important activities for product committees.

IEC 62920:2017 (Ed.1.0) is amended to extend the scope of IEC 62920:2017 (Ed.1.0) by taking into account the following technical items.

– DC to DC power conversion equipment used in photovoltaic power energy systems.

– Electrical energy storage devices connected to DC power ports of PCE used in photovoltaic power energy systems.

Furthermore, IEC 62920:2017 (Ed.1.0) is amended to cover the latest options of measurement distance of radiated disturbances by taking the latest updates of CISPR 16-1-4 and CISPR 16-2-3 into consideration to adapt it to different sizes of products.

1 Scope

Replace the existing first paragraph with the following:

This document specifies electromagnetic compatibility (EMC) requirements for power conversion equipment (PCE) (e.g. DC to DC, DC to AC and AC to DC) for use in photovoltaic (PV) power systems with or without DC-coupled electrical energy storage devices.

3 Terms and definitions

Replace the existing terms and definitions with the following:

3.1
photovoltaic power generating system
PV system
electric power generating system which uses the photovoltaic effect to convert solar power into electricity

3.2
power conversion equipment
PCE
electrical device converting one form of electrical power to another form of electrical power with respect to voltage, current, frequency, phase and the number of phases

[SOURCE: IEC 62109-1:2010, 3.66, modified – The definition has been rephrased, and the note has been deleted.]

3.3
photovoltaic module
PV modules
complete and environmentally protected assembly of interconnected photovoltaic cells

[SOURCE: IEC TS 61836:2016, 3.1.48.7, modified – The note has been deleted.]

3.4
electrical energy storage devices
ESS

devices that are able to absorb electrical energy, to store it for a certain amount of time and to release electrical energy during which energy conversion processes may be included

[SOURCE: IEC 62933-1:2018, 3.1, modified – The example and the note have been deleted.]

3.5
port
particular interface of the PCE with the external electromagnetic environment

Note 1 to entry: See Figure 1 for examples of ports.

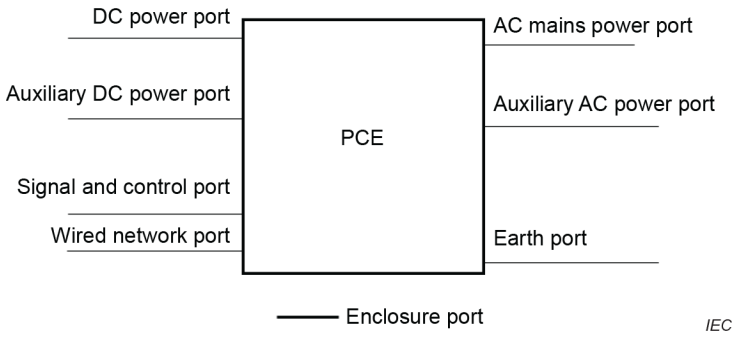


Figure 1 – Example of ports

3.6
enclosure port
physical boundary of the PCE product which electromagnetic fields may radiate through or impinge on

3.7
AC mains power port
port used to connect to a public low voltage AC mains power distribution network or other low voltage AC mains installation

3.8
auxiliary AC power port
additional low voltage AC power port for purposes other than feeding in AC power

3.9
DC power port
port used to connect a local low voltage DC power generating system or electrical energy storage devices

3.10
auxiliary DC power port
additional low voltage DC power port for purposes other than supplying DC power for the DC to AC conversion or electrical energy storage devices

3.11
signal and control port
port intended for the interconnection of components of PCE, or between PCE and local auxiliary equipment, and used in accordance with relevant functional specifications

Note 1 to entry: Examples include RS-232, Universal Serial Bus (USB), high-definition multimedia interface (HDMI), IEEE standard 1394 (“Fire Wire”) and control pilot.

3.12
wired network port
point to connection for voice, data and signalling transfers intended to interconnect widely dispersed systems by direct connection to a single-user or multi-user communication network

Note 1 to entry: Examples include CATV, PSTN, ISDN, xDSL, LAN and similar networks. These ports can support screened or unscreened cables and can also carry AC or DC power where this is an integral part of the telecommunication specification.

3.13
high power electronic equipment and system
one or more power conversion equipment with a combined rated power greater than 75 kVA, or a system containing such equipment

3.14
low voltage
LV
set of voltage levels used for the distribution of electricity and whose upper limit is generally accepted to be 1 000 V AC or 1 500 V DC

3.15
high voltage
HV
a) in a general sense, the set of voltage levels in excess of low voltage

b) in a restrictive sense, the set of upper voltage levels used in power system for bulk transmission of electricity

[SOURCE: IEC 60050-601:1985, 601-01-27]

3.16
medium voltage
MV
any set of voltage levels lying between low and high voltage

[SOURCE: IEC 60050-601:1985, 601-01-28, modified – The note has been deleted.]

3.17
small equipment
equipment including its cables fits in an imaginary cylindrical test volume of 1,5 m in diameter and 1,5 m in height (to ground plane) to be measured at a measurement distance of 3 m at an OATS/SAC

3.18
medium equipment
equipment including its cables fits in an imaginary cylindrical test volume of 2 m in diameter and 2 m in height (to ground plane) to be measured at a measurement distance of 5 m at an OATS/SAC

3.19
type test
test of one or more equipment made to a certain design to show that the design meets certain specifications

3.20
residential environment
environment characterized by the fact that the product is directly (not via external transformer) connected to a public low voltage AC mains power distribution network or other low voltage AC mains installation

3.21
non-residential environment
environment characterized by a separate power network, supplied from a dedicated power transformer or a high- or medium-voltage transformer

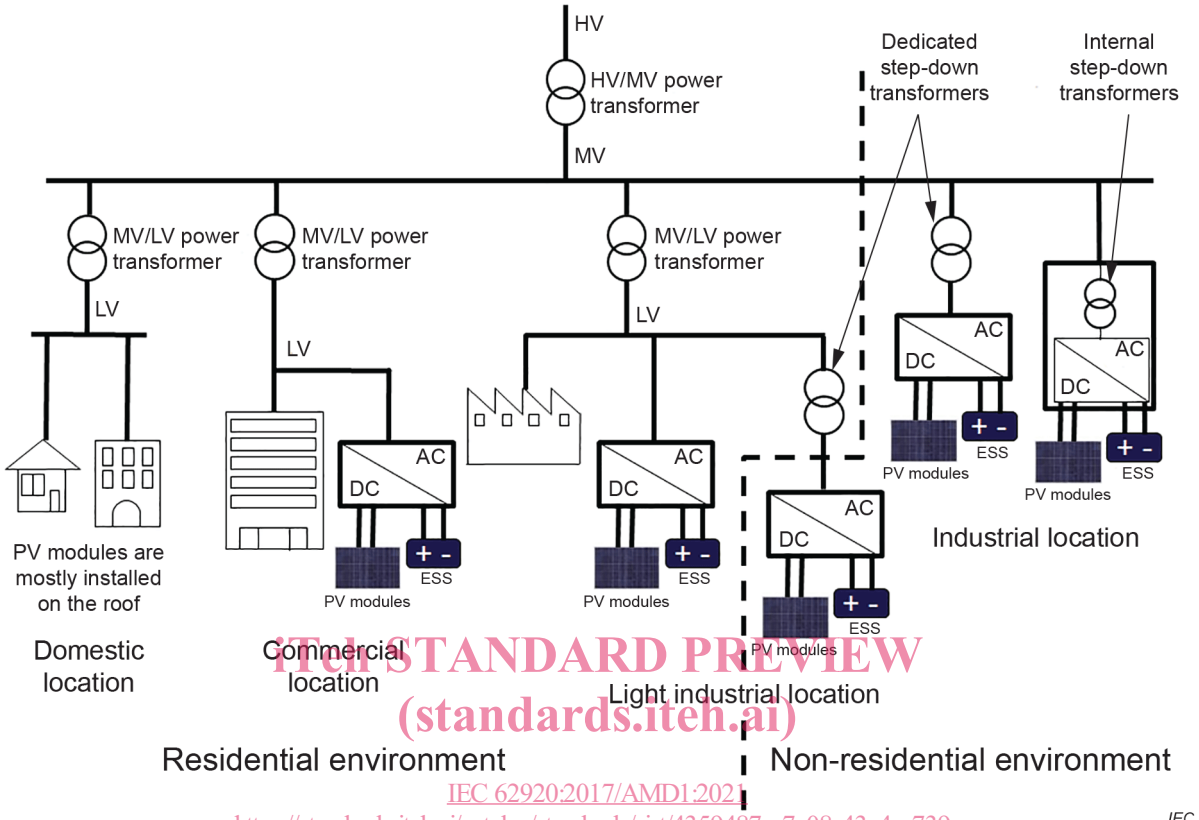
3.22
PCE-MV
PCE including a medium voltage transformer

3.23
artificial mains network
AMN
network that provides a defined impedance to the equipment under test (EUT) at radio frequencies, couples the disturbance voltage to the measuring receiver and decouples the test circuit from the low voltage AC mains supply

3.24
artificial DC network
DC-AN
artificial network used for defined termination of the EUT's port under test also providing the necessary decoupling from conducted disturbances originating from the laboratory low voltage DC power source

4.1 Category of environment

Replace the existing Figure 2 with the following:



4.2 Division into classes

Add, at the end of the subclause, the following new note:

NOTE Such equipment would fulfil the tighter emission requirements of the residential environment as well as the severe immunity requirements of the industrial environment.

5.1 General

Replace the existing text with the following:

Emission and immunity testing of PCE can be conducted with or without solar photovoltaic modules or storage devices. However, only the PCE is subject to testing. Therefore, the test may be conducted with a uni- or bi-directional appropriate DC power supply to simulate a PV module and a storage device. The DC power supply shall provide a continuous and stable DC voltage, load or power during testing. In addition, this alternative DC supply shall be designed in such a manner that harmonics and electromagnetic disturbance from the DC supply do not influence test results.

Similarly, a uni- or bi-directional appropriate AC power supply should be used so that continuous and stable AC voltage and frequency for the PCE can be supplied during testing. Harmonics and electromagnetic disturbance generated by the AC power source shall not influence test results.

The uni- or bi-directional appropriate DC power supply and AC power supply are connected to the DC power port and the AC mains power port. Auxiliary power ports, if any, and if necessary to operate the PCE as intended, shall be connected to the appropriate power supply during testing.

The uni- or bi-directional AC and/or DC power supply shall support all operating modes of PCE to be tested.

5.2.1 General

Replace the existing fourth paragraph with the following:

The DC power ports of the PCE shall be connected to a suitable DC power supply. The DC voltage of this power supply shall be adjustable to provide a voltage level within the rated operation range for the respective type of PCE. A dedicated DC power source in the test laboratories, sets of batteries or also other DC energy sources such as fuel cell modules can be used, provided that they allow for continuous and stable voltage and current and other conditions necessary for PCE within rated operating modes and conditions during testing.

Replace, in the existing fifth paragraph, "DC power sources" *with* "DC power supply".

*Replace, in the existing sixth paragraph, both instances of "*AC power source" *with* "AC power supply".

Replace, in the existing seventh paragraph, "power sources" *with* "power supply".

5.2.4.1 Conducted disturbances

Replace the existing last paragraph with the following:

Measurement of conducted disturbances at signal and control ports shall be carried out according to Table A.11 of CISPR 32:2015. Measurement arrangement is described in C.4.1.1 and Annex D of CISPR 32:2015. Asymmetric artificial networks or current probes shall be used to measure asymmetric mode conducted emissions at the signal and control ports.

6.1 General

Replace the existing text with the following:

This document defines three operating modes for compliance testing, as follows.

Standby mode: The PCE is connected to the AC mains and is energized but does not generate or feed power into the AC mains or electrical energy storage devices. The voltage level at the DC power ports need not to be within the rated operation range.

Operating mode to feed into AC grid and/or to discharge from electrical energy storage devices: The PCE shall operate at a rated operation point.

Operating mode to charge electrical storage device from PV modules and/or AC grid: The PCE shall operate at a rated operation point.

6.2 Operating conditions for immunity requirement test

Replace the existing second paragraph to fifth paragraph with the following:

The electrostatic discharge immunity test shall be conducted under all the operating conditions for the PCE in standby mode and operating modes. The PCE shall be continually operated at its most sensitive operating point determined by preliminary testing.

The radiated radio-frequency electromagnetic field immunity test, electrical fast transient/burst immunity test and surge immunity test shall be conducted in operating mode or modes.

The surge test in addition shall be conducted in the standby mode with relays opened. In case that relays are installed on AC and/or DC sides, a state with relays opened may be the worst case for surge immunity because loads and/or sources are missing.

The immunity test to conducted disturbances induced by radio-frequency fields as well as voltage dips and voltage interruption shall also be conducted in operating mode or modes. During testing, it is recommended that the PCE is operated at the maximum power to feed into AC mains and/or electrical energy storage devices. If the maximum feeding power is not technically available due to the restriction of power capacity and DC voltage level of power supply and test equipment in the laboratory, it may be necessary to conduct some investigatory testing to adjust the feeding power of the PCE and DC voltage level at the DC power ports.

6.3 Operating conditions for low frequency emission requirement test

Replace the existing first paragraph with the following:

The low frequency emission test shall be carried out under the normal operating modes and conditions determined by preliminary testing.

Replace, in the existing second paragraph, "operating mode" *with* "operating modes".

6.4 Operating conditions for high frequency emission requirement test

Add, after the existing note, the following new note 2, and renumber the existing note as note 1:

NOTE 2 DC to DC conversion also contributes to emission. This is especially the case for equipment with buck and/or boost converters (e.g. optimizers and, ports for an electrical energy storage device). Any effect of the DC to DC conversion function to emission can be tested only if activated.

Replace, in the existing second paragraph, "AC mains" *with* "AC mains or dis-/charging from/to electrical energy storage devices".

7.1 Requirements

Replace the existing first paragraph with the following:

The immunity requirements in Table 1 shall be applied to class B PCE. The immunity requirements in Table 2 shall be applied to class A PCE.

8.2.1.3 Disturbance voltage limits at the DC power port

Replace the existing text of this subclause with the following:

Limits for the disturbance voltage at the DC power port in the frequency range 150 kHz to 30 MHz for PCE measured on a test site are given in Table 8 and Table 9. Table 8 is for class A PCE, and Table 9 for class B.

Limits for the disturbance voltage at the auxiliary DC power port are provided in Table 8 and Table 9.

Selection of the appropriate set of limits at each auxiliary DC power port shall be based on the rated power given in product specification.

In case of DC/DC converters component, the selection of the appropriate set of limits at each DC power port shall be based on the rated power of PCE given in product specification.

The applicability of these limits is defined in Table 14.