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colour inside

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 CSV(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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PHOTOVOLTAIC POWER GENERATING SYSTEMS – EMC REQUIREMENTS AND TEST METHODS FOR POWER CONVERSION EQUIPMENT

FOREWORD

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IEC 62920 edition 1.1 contains the first edition (2017-07) [documents 82/1288/FDIS and 82/1313/RVD] and its amendment 1 (2021-04) [documents 82/1835/FDIS and 82/1874/RVD].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 62920 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

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

The committee has decided that the contents of the base publication and its amendment 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- withdrawn,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.

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INTRODUCTION

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 electric power, and to feed the AC power energy into the AC mains network or loads.

In recent years, standardization of EMC requirements for PCE has become more active. For example, CISPR/B has been considering the limits and measurement method for conducted disturbances at DC power ports of grid connected power converters since 2008. These proposed limits and measurement methods form the basis of the instructions for supplementing CISPR 11 in order to cover the set of EMC requirements for the PCE applying to the solar photovoltaic power energy systems. EMC requirements for PCE were added in CISPR 11 Ed.6.0 which was published in 2015. Some product committees, which consider products utilizing PCE, have their own product standards on EMC requirements. SC 22G has developed IEC 61800-3 to define the limits and test methods for power drive systems. SC 22H has IEC 62040-2 for uninterrupted power supplies, and TC 26 has IEC 60974-10 for arc welding. TC 9 sets the emission limits with IEC 62236 (all parts). Moreover, TC 69 will have IEC 61851-21-2 [1] covering EMC requirements for conducted charging stations for electric vehicles.

Purpose of the development of a product EMC standard

IEC Guide 107 specifies that TC 77 and CISPR have responsibility for developing the basic and generic standards for EMC requirements of products. Therefore, product committees are not free to set their own emission limits. If product committees intend to require immunity to particular disturbances, they shall refer to these basic EMC immunity standards.

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 shall 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 limits and test methods for their products.

On the other hand, TC 82 does not have its own product EMC standards. Therefore, TC 82 has to refer to the generic standards. Nevertheless, TC 82 has the responsibility to consider EMC requirements for PCE applying to the solar photovoltaic power energy systems, and TC 82 can take action as follows to develop its own product EMC standards:

a) select the immunity test items in accordance with EMC environments for the solar photovoltaic power energy systems;

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

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

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

This document presents the minimum EMC requirements for PCE applying to solar photovoltaic power energy systems.

[1] Under preparation. Stage at the time of publication: IEC AFDIS 61851-21-2:2017.

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.

PHOTOVOLTAIC POWER GENERATING SYSTEMS – EMC REQUIREMENTS AND TEST METHODS FOR POWER CONVERSION EQUIPMENT

1 Scope

This document specifies electromagnetic compatibility (EMC) requirements for ~~DC to AC~~ 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.

The PCE covered by this document can be grid-interactive, which is termed as a grid connected power converter (GCPC), or stand-alone. It can be supplied by single or multiple photovoltaic modules grouped in various array configurations, and can be intended for use in conjunction with batteries or other forms of energy storage.

NOTE A micro inverter is an example of a GCPC supplied by a single photovoltaic module.

This document covers not only PCE connected to a public low voltage AC mains network or other low voltage AC mains installation, but also PCE connected to a medium or high voltage AC network with or without step-down power transformers. Requirements for the PCE connected to a medium or high voltage AC network are specified in this document. However, some requirements relevant to grid interconnection are addressed with other standards specifying power quality or their own grid codes in some countries.

NOTE DC/DC converters used for PV systems are not yet covered in this document. They can cause electromagnetic interference due to conducted disturbances at DC ports.

PCE is assessed with EMC requirements as a type test at a test site. This document provides test methods and test conditions for PCE as well as emission and immunity requirements, but not for photovoltaic modules and other balance of system components.

When compliance with EMC requirements at the test site cannot be shown due to technical reasons of the test site, PCE can be assessed in situ, such as at the manufacturer's premises or in the field where the PCE is assembled into a PV power system. However, only high frequency emission requirements for in situ assessment are specified in CISPR 11.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 61000-3-2:2014, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment with input current ≤ 16 A per phase)*

IEC 61000-3-3:2013, *Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection*

IEC TR 61000-3-6:2008, *Electromagnetic compatibility (EMC) – Part 3-6: Limits – Assessment of emission limits for the connection of distorting installations to MV, HV and EHV power systems*

IEC 61000-3-11:2000, *Electromagnetic compatibility (EMC) – Part 3-11: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems – Equipment with rated current ≤ 75 A and subject to conditional connection*

IEC 61000-3-12:2011, *Electromagnetic compatibility (EMC) – Part 3-12: Limits – Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase*

IEC TR 61000-3-14:2011, *Electromagnetic compatibility (EMC) – Part 3-14: Assessment of emission limits for harmonics, interharmonics, voltage fluctuations and unbalance for the connection of disturbing installations to LV power systems*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*
IEC 61000-4-3:2006/AMD1:2007
IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-7:2002, *Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement techniques – General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto*
IEC 61000-4-7:2002/AMD1:2008

IEC 61000-4-11:2004, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

IEC 61000-4-34:2005, *Electromagnetic compatibility (EMC) – Part 4-34: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current more than 16 A per phase*

CISPR 11:2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*
CISPR 11:2015/AMD1:2016

CISPR 16-1-2:2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Coupling devices for conducted disturbance measurements*

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.