IEC 62909-1

Edition 1.0 2017-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Bi-directional grid-connected power converters – Part 1: General requirements

Convertisseurs de puissance connectés aux réseaux bidirectionnels – Partie 1: Exigences générales

IEC 62909-1:2017-05

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 29.200

ISBN 978-2-8322-4365-7

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Part 1: General requirements

FOREWORD

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International Standard IEC 62909-1 has been prepared by subcommittee 22E: Stabilized power supplies, of IEC technical committee 22: Power electronic systems and equipment.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
22E/182/FDIS	22E/183/RVD

Full information on the voting for the approval of this International Standard 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.

This publication is to be read in conjunction with IEC 62477-1:2012. It follows the structure of IEC 62477-1:2012 and supplements or modifies its corresponding clauses. Wherever the term "PECS" appears in the cited clauses, it needs to be replaced by "GCPC".

A list of all parts in the IEC 62909 series, published under the general title *Bi-directional grid connected power converters,* can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

The solution to global warming and fossil fuel depletion requires an expansion of renewable energy and the spread of distributed energy resources, with the new infrastructure containing micro-grids and smaller-scale nano-grids. Nano-grid systems are especially suited to increasing energy-usage efficiency and reducing power consumption of homes by combining and optimally controlling energy storage with generators.

In order to optimize the power consumption within the nano-grid of a home, it is necessary to supply the electricity its residents require by combining and optimizing an electricity generator with rechargeable energy storage. Independent generators and battery storage units are already on the market; but, for such new systems, development has just started. Although power generation sources and storage batteries are generally expensive, the tendency of this is still more remarkable in the early stage in which a market is formed. For stable growth of a market, extendibility, compatibility, and robustness of such system are especially important. If a connecting interface is standardized and compatibility is insured, many products can be put onto the market and their prices can be kept at a proper level. If a new standard is utilized for product certification, their broad acceptance can be earlier and greater. From the above viewpoint, it is necessary to promptly advance standardization of bi-directional grid-connected power converter (GCPC) which combined the source of power generation and the storage battery. This part of IEC 62909 provides common general requirements independent of special characteristics of individual applications.

BI-DIRECTIONAL GRID-CONNECTED POWER CONVERTERS –

Part 1: General requirements

1 Scope

This part of IEC 62909 specifies general aspects of bi-directional grid-connected power converters (GCPC), consisting of a grid-side inverter with two or more types of DC-port interfaces on the application side with system voltages not exceeding 1 000 V AC or 1 500 V DC. In special cases, a GCPC will have only one DC-port interface, which is connected to a bidirectional energy-storage device. This document includes terminology, specifications, performance, safety, system architecture, and test-case definitions. The "system architecture" defines interaction between the inverter and converters. Requirements which are common, general, and independent of special characteristics of individual generators and bi-directional storages are defined.

This document does not cover uninterruptible power supply (UPS) systems, which fall under the scope of IEC 62040 (all parts). Requirements for internal and external digital communication might be necessary; the interface requirements including communication with distributed energy resources are provided in a future part of IEC 62909. All EMC requirements are defined by reference to existing IEC standards. External communication requirements are out of scope of this document.

NOTE The control signal from the grid is not defined in this document.

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 60038:2009, *IEC standard voltages*

IEC 60146-2:1999, *Semiconductor converters – Part 2: Self-commutated semiconductor converters including direct d.c converters*

IEC 61000-3-2:2014, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

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 61727:2004, *Photovoltaic (PV) systems – Characteristics of the utility interface*

IEC 62109-1:2010, *Safety of power converters for use in photovoltaic power systems – Part 1: General requirements*

IEC 62040-3:2011, *Uninterruptible power systems (UPS) – Part 3: Method of specifying the performance and test requirements*