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

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 11/25

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Bi-directional grid-connected power converters - Part 1: General and safety requirements (IEC 62909-1:2025)

Convertisseurs de puissance connectés aux réseaux bidirectionnels - Partie 1: Exigences générales et de sécurité
(IEC 62909-1:2025)

Bidirektionale netzgekoppelte Leistungsumrichter - Teil 1: Allgemeine- und Sicherheitsanforderungen
(IEC 62909-1:2025)

European Committee for Electrotechnical Standardization
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Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN IEC 62909-1:2025 E

European foreword

The text of document 22E/288/FDIS, future edition 2 of IEC 62909-1, prepared by SC 22E "Stabilized power supplies" of IEC/TC 22 "Power electronic systems and equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62909-1:2025.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2026-09-30
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2028-09-30

This document supersedes EN IEC 62909-1:2018 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 62909-1:2025 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 61851 series	NOTE	Approved as EN IEC 61851 series
IEC 61851-23:2023	NOTE	Approved as EN IEC 61851-23:— (not modified)[1]
IEC 62040 series	NOTE	Approved as EN 62040 series
IEC 62040-1:2017	NOTE	Approved as EN IEC 62040-1:2019 (not modified) +A11:2021
IEC 62109 series	NOTE	Approved as EN IEC 62109 series
IEC 62109-2:2011	NOTE	Approved as EN 62109-2:2011 (not modified)

[1] Under preparation. Stage at the time of publication: FprEN IEC 61851-23:2025.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cencenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60038 (mod)	2009	IEC standard voltages	EN 60038	2011
+ A1	2021		-	-
IEC 60146-2	1999	Semiconductor converters - Part 2: Self-commutated semiconductor converters including direct d.c. converters	EN 60146-2	2000
IEC 62040-3	2021	Uninterruptible power systems (UPS) - Part 3: Method of specifying the performance and test requirements	EN IEC 62040-3	2021
IEC 62109-1	2010	Safety of power converters for use in photovoltaic power systems - Part 1: General requirements	EN 62109-1	2010
IEC 62477-1	2022	Safety requirements for power electronic converter systems and equipment - Part 1: General	EN IEC 62477-1	2023
IEC/TS 62786-1	2023	Distributed energy resources connection with the grid - Part 1: General requirements	-	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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IEC 62909-1 has been prepared by subcommittee 22E: Stabilized power supplies, of IEC technical committee 22: Power electronic systems and equipment. It is an International Standard.

This second edition replaces the first edition published in 2017. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) the title has been changed by adding the wording "and safety";
b) the scope has been changed in order to clarify the bi-directional grid-connected power converters (GCPCs) covered by this document.

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

Draft	Report on voting
22E/288/FDIS	22E/292/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,
– withdrawn, or
– revised.

INTRODUCTION

The solution to global warming and fossil fuel depletion requires an expansion of renewable energy and the spread of distributed energy sources. For example, energy management systems are especially suited to increasing energy-usage efficiency and reducing power consumption of residential and commercial.

In order to optimize the power consumption within the home power management, it is important to optimally combine electricity generation with rechargeable energy storage such as electric vehicles and battery systems. This optimization is accomplished, in part, by providing an efficient transfer between DC and AC electricity to accommodate storage batteries. The IEC 62909 series describes a bi-directional grid-connected power converter (GCPC) efficiently connected to sources of power generation and energy storage.

This document provides common general and safety requirements independent of special characteristics of individual applications.

1 Scope

This part of IEC 62909 specifies general and safety aspects of bi-directional grid-connected power converters (GCPC), consisting of a grid-side inverter with two or more types of DC power ports on the application side with system voltages not exceeding 1 000 V AC or 1 500 V DC.

This document can also be used for the special case of a multiple DC power port GCPC used in an application requiring only one DC power port.

This document considers general aspects such as terminology, specifications, performance, system architecture, as well as safety requirements.

This document does not cover

– uninterruptible power supply (UPS) systems, which fall under the scope of the IEC 62040 series,
– power conversion equipment for use in photovoltaic systems, which fall under the scope of the IEC 62109 series, and
– bi-directional power converters to charge or discharge the batteries located within electric vehicles or in the charging station, which fall under the scope of the IEC 61851 series.

NOTE 1 The external system (e.g. energy management system, utility operations system) is not defined in this document.

NOTE 2 The power converter sub-system case for use in electrical energy storage systems is currently covered by this document but will be covered by the IEC 63285 series[1].

NOTE 3 Annex A provides examples of GCPCs. These examples contain GCPCs covered and not covered by 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 60038:2009/AMD1:2021

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

IEC 62040-3:2021, *Uninterruptible power systems (UPS) - Part 3: Method of specifying the performance and test requirements*

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

IEC 62477-1:2022, *Safety requirements for power electronic converter systems and equipment - Part 1: General*

IEC TS 62786-1:2023, *Distributed energy resources connection with the grid - Part 1: General requirements*

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1 Under preparation.