

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Bi-directional grid-connected power converters –  
Part 2: Interface of GCPC and distributed energy resources**  
(standards.iteh.ai)

**Convertisseurs de puissance connectés aux réseaux bidirectionnels –  
Partie 2: Interface du GCPC avec les ressources énergétiques réparties**

IEC 62909-2:2019  
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**BI-DIRECTIONAL GRID-CONNECTED POWER CONVERTERS –****Part 2: Interface of GCPC and distributed energy resources**

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International Standard IEC 62909-2 has been prepared by subcommittee 22E: Stabilized power supplies, of IEC technical committee 22: Power electronic systems and equipment.

This International Standard is to be used in conjunction with IEC 62909-1:2017.

The clauses of particular requirements in this document supplement or modify the corresponding clauses in IEC 62909-1:2017. Where the text of subsequent clauses indicates an "addition" to or a "replacement" of the relevant requirement, test specification or explanation of IEC 62909-1:2017, these changes are made to the relevant text of IEC 62909-1:2017. Where no change is necessary and the clause is applicable, the words "The provisions of IEC 62909-1:2017, Clause XX shall apply" are used. Additional clauses, tables, figures and notes which are not included in IEC 62909-1:2017, are numbered starting from 101.

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

FDIS	Report on voting
22E/196/FDIS	22E/198/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.

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- withdrawn,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

In order to optimize power consumption, for example, within the nanogrid of a home, electricity generation should be optimally combined with rechargeable energy storage. 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) which efficiently integrates sources of power generation with energy storage.

IEC 62909-1 defines common general requirements, independent from the special characteristics of individual applications. This document defines the additional requirements necessary for interfacing particular types of distributed energy resources to a GCPC.

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# BI-DIRECTIONAL GRID-CONNECTED POWER CONVERTERS –

## Part 2: Interface of GCPC and distributed energy resources

### 1 Scope

This part of IEC 62909 specifies GCPC interface requirements for particular distributed energy resources, namely electric vehicle (EV), battery, and photovoltaic (PV) systems. These requirements are in addition to the general requirements given in IEC 62909-1.

### 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 60730-1:2013, *Automatic electrical controls – Part 1: General requirements*  
IEC 60730-1:2013/AMD1:2015

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 61851-23:2014, *Electric vehicle conductive charging system – Part 23: DC electric vehicle charging station*  
<http://standards.iteh.ai/catalog/standards/sist/c4e6b600-7118-46f1-90fb-93fcf14512a9/iec-62909-2-2019>

IEC 62909-1:2017, *Bi-directional grid-connected power converters – Part 1: General requirements*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62909-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

Table 101 provides an alphabetical cross-reference listing of terms.

**Table 101 – Alphabetical list of terms**

Term	Term number	Term	Term number	Term	Term number
arc fault detector AFD	3.101	distributed energy resources	3.113	photovoltaic PV	3.124
arc fault interrupter AFI	3.102	earth fault	3.114	PV DC-port interface	3.125
battery management system BMS	3.103	electric vehicle EV	3.115	PV section	3.126
battery system BS	3.104	EV DC/DC converter	3.116	shutdown sequence	3.127
BS section	3.105	EV DC-port interface	3.117		
BS DC-port interface	3.106	EV section	3.118		
charge/discharge switch	3.107	fault status signal	3.119		
charging connector	3.108	GCPC	3.120		
DC-connection interface	3.109	GCPC fault detection circuit	3.121		
DC/DC converter	3.110	grid-independent operation	3.122		
DC-port interface	3.111	isolated DC/DC converter	3.123		
dedicated auxiliary power port	3.112				

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Add the following terms and definitions:

**3.101**  
**arc fault detector**  
**AFD**  
 device or group of devices to detect arcs

Note 1 to entry: This note applies to the French language only.

**3.102**  
**arc fault interrupter**  
**AFI**  
 device able to interrupt arc faults triggered by an arc fault detector

Note 1 to entry: This note applies to the French language only.

**3.103**  
**battery management system**  
**BMS**  
 electronic system associated with a battery which has functions to cut off or disconnect it in case of overcharge, overcurrent, overdischarge, and overheating

Note 1 to entry The BMS monitors and/or manages the battery's state, calculates secondary data, reports that data and/or controls the battery's environment to influence its safety, performance and/or service life.

Note 2 to entry Cut-off or disconnection due to overdischarge is not mandatory if there is an agreement between the cell manufacturer and the GCPC manufacturer.

Note 3 to entry The function of the BMS can be assigned to the battery pack or to equipment that uses the battery.

Note 4 to entry The BMS can be divided and it can be found partially in the battery pack and partially on the equipment that uses the battery.

Note 5 to entry The BMS is sometimes also referred to as a BMU (battery management unit).

Note 6 to entry: This note applies to the French language only.

[SOURCE: IEC 62619:2017, 3.12, modified – The definition, Note 1 and Note 2 have been rephrased.]

### 3.104

#### **battery system**

##### **BS**

system which comprises one or more cells, modules or battery packs

Note 1 to entry It has a battery management system to cut off or disconnect it in case of overcharge, overcurrent, overdischarge, and overheating. Where cells, modules and battery packs employ an acid electrolyte, the BMS may be absent from the battery system provided that the BMS functions are integral to the BS section

Note 2 to entry Cut-off or disconnection due to overdischarge is not mandatory if there is an agreement between the cell manufacturer and the GCPC manufacturer

Note 3 to entry The battery system may have cooling or heating units.

[SOURCE: IEC 62619:2017, 3.11, modified – Note 1 and Note 2 have been rephrased.]

### 3.105

#### **BS section**

part of a GCPC between the DC-connection interface and a BS DC-port interface

### 3.106

#### **BS DC-port interface**

DC-port interface connected to a battery system

### 3.107

#### **charge/discharge switch**

switch for preventing unintentional power flow which is located between the DC-connection interface and a DC/DC converter, or between a DC/DC converter and an EV DC-port interface

### 3.108

#### **charging connector**

means of enabling the manual connection of a flexible cable to an EV for the purpose of charging the traction batteries

### 3.109

#### **DC-connection interface**

internal system DC bus between the DC/DC converters and the bi-directional inverter

[SOURCE: IEC 62909-1:2017, 3.4, modified – "power electronic" has been replaced with "DC/DC".]

### 3.110

#### **DC/DC converter**

equipment that converts one DC voltage to another DC voltage

[SOURCE: IEC 62909-1:2017, 3.6]

### 3.111

#### **DC-port interface**

interface between the DC/DC converter and distributed energy resources or, in the case where the DC-connection interface is directly connected to distributed energy resources

without the DC/DC converter, between the DC-connection interface and the distributed energy resources

[SOURCE: IEC 62909-1:2017, 3.5]

**3.112**

**dedicated auxiliary power port**

special port to supply auxiliary power from the EV to the GCPC to wake up the GCPC from operating in an idle state

**3.113**

**distributed energy resources**

DC power sources generating and/or storing electricity near the consuming area

[SOURCE: IEC 62909-1:2017, 3.9, modified – The note has been deleted.]

**3.114**

**earth fault**

occurrence of an accidental conductive path between a live conductor and the Earth

[SOURCE: IEC 60050-826:2004, 826-14-13, modified – The notes have been deleted.]

**3.115**

**electric vehicle**

**electric road vehicle**

**EV**

any vehicle propelled by an electric motor drawing current from a rechargeable energy storage system (RESS), intended primarily for use on public roads

[SOURCE: IEC 60364-7-722:2018, 722.3.1]

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**3.116**

**EV DC/DC converter**

component of the EV section that converts one DC voltage to another DC voltage

**3.117**

**EV DC-port interface**

DC-port interface connected to an EV

**3.118**

**EV section**

part of a GCPC between the DC-connection interface and an EV DC-port interface

**3.119**

**fault status signal**

signal indicating that faults are present which could cause a hazard according to IEC 62909-2

**3.120**

**bi-directional grid-connected power converter**

**grid-connected power converter**

**GCPC**

power converter connected to the grid by the bi-directional inverter with multiple DC-port interfaces

Note 1 to entry: This note applies to the French language only.

[SOURCE: IEC 62909-1:2017, 3.19]

**3.121****GCPC fault detection circuit**

circuit that detects functional faults in a GCPC

**3.122****grid-independent operation**

electricity supply through GCPC to an AC load during grid isolation

[SOURCE: IEC 62909-1:2017, 3.20]

**3.123****isolated DC/DC converter**

DC/DC converter with DC circuit on output side which is electrically separated by at least basic insulation from input side

**3.124****photovoltaic****PV**

relating to the conversion of light directly into electrical energy

[SOURCE: IEC 62109-1:2010, 3.55]

**3.125****PV DC-port interface**

DC-port interface connected to a PV system

**3.126****PV section**

part of a GCPC between the DC-connection interface and a PV DC-port interface

**3.127****shutdown sequence**

sequence for electrically disconnecting an EV from its DC-connection interface

**4 GCPC general specifications****4.1 General**

The provisions of IEC 62909-1:2017, 4.1 shall apply.

**4.2 Description of GCPC and its components**

The provisions of IEC 62909-1:2017, 4.2 shall apply.

**4.3 Operating modes**

The provisions of IEC 62909-1:2017, 4.3 shall apply.

**4.4 Interfaces with distributed energy resources**

*Addition:*

EV, battery system and PV distributed energy resource interfaces shall comply with the requirements in Clauses 101, 102, and 103, respectively.

NOTE 101 In the case where GCPC requirements conflict with requirements for other distributed energy resources, manufacturers consider the more stringent requirements.

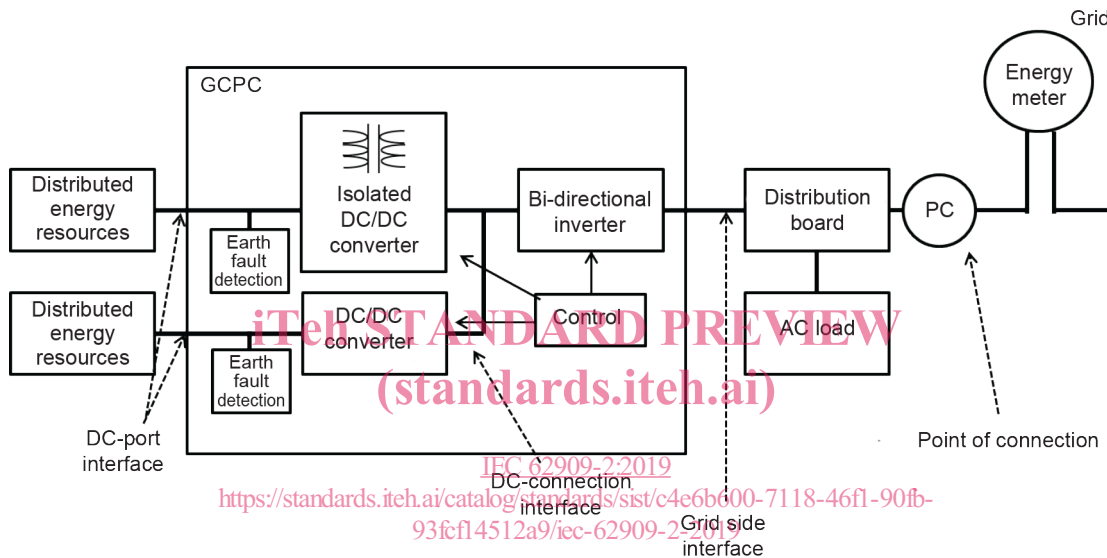
NOTE 102 As for grid interface of GCPC, a description of the compliance with applicable national requirements is provided in 5.3.1 of IEC 62909-1:2017.

Add the following new subclause:

**4.101 Specific requirements for earth fault detection on DC-port interfaces**

Some distributed energy resources require an earth fault detection circuit on the DC-port interface for safety.

When a GCPC has multiple earth fault detection circuits on its DC-port interfaces, each earth fault detection circuit shall have little or no influence on any other GCPC fault detection circuit. An example of a GCPC with multiple earth fault detection circuits is shown in Figure 101.



NOTE Point of the connection is the reference point where the user's electrical installation is connected to the grid. Power flows through this point to and from the grid, unless it is disconnected.

**Figure 101 – GCPC with multiple earth fault detection circuits**

**5 Performance requirements**

The provisions of IEC 62909-1:2017, Clause 5 shall apply.

**6 Hazard protection requirements**

The provisions of IEC 62909-1:2017, Clause 6 shall apply.

**7 Test requirements**

The provisions of IEC 62909-1:2017, Clause 7 shall apply.

**8 Information and marking requirements**

The provisions of IEC 62909-1:2017, Clause 8 shall apply.

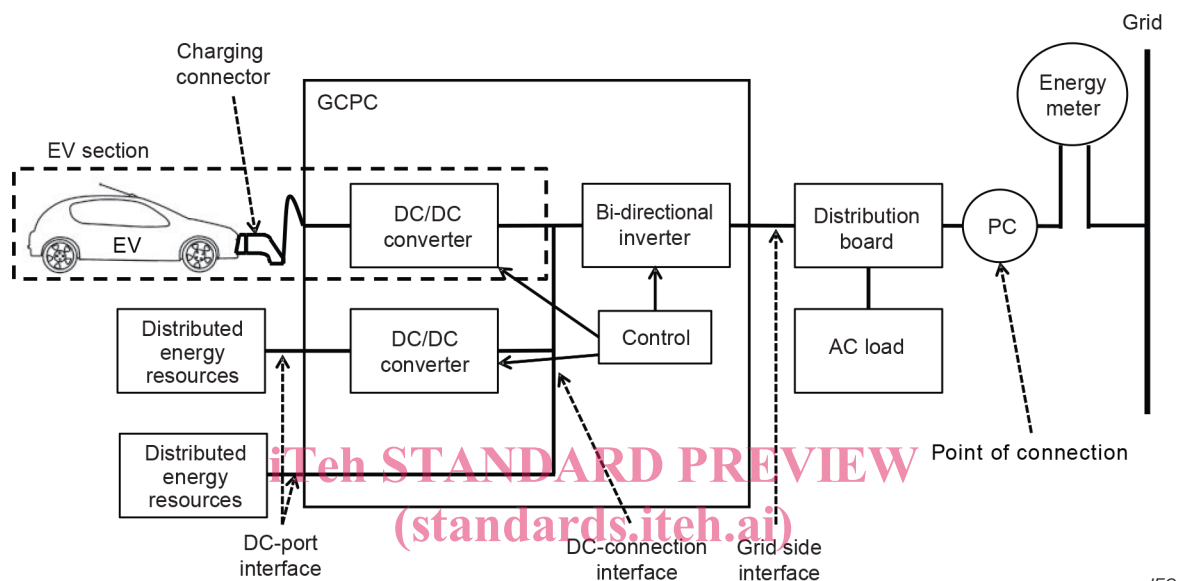
Add the following new clauses:

## 101 Interface requirements for EV section

### 101.1 General system requirement and interface

The provisions of IEC 61851-23:2014, Clause 6 shall apply.

For the purposes of Clause 101, each occurrence of "d.c. EV charging station" in the relevant clauses of IEC 61851-23:2014 referred to in this document shall be replaced with "GCPC including EV section". An example of a GCPC with an EV section is shown in Figure 102.



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**Figure 102 – GCPC with EV section**

### 101.2 Protection against electric shock

The provisions of IEC 61851-23:2014, Clause 7 shall apply.

### 101.3 Connection between the power supply and the EV

The provisions of IEC 61851-23:2014, Clause 8 shall apply

### 101.4 EV coupler requirements

The provisions of IEC 61851-23:2014, Clause 9 shall apply.

### 101.5 Charging cable assembly requirements

The provisions of IEC 61851-23:2014, Clause 10 shall apply.

### 101.6 Specific requirements for GCPC including EV section

The provisions of IEC 61851-23:2014, Clause 101 shall apply.

### 101.7 Communication

The provisions of IEC 61851-23:2014, Clause 102 shall apply.