

---

**Varnost močnostnih pretvornikov, ki se uporabljajo v fotonapetostnih sistemih - 3. del: Posebne zahteve za elektronske naprave v kombinaciji s fotonapetostnimi elementi**

Safety of power converters for use in photovoltaic power systems - Part 3: Particular requirements for electronic devices in combination with photovoltaic elements

Sicherheit von Leistungsumrichtern zur Anwendung in photovoltaischen Energiesystemen - Teil 3: Besondere Anforderungen an elektronische Geräte in Kombination mit Photovoltaik-elementen

Sécurité des convertisseurs de puissance utilisés dans les systèmes photovoltaïques - Partie 3: Exigences particulières pour les dispositifs électroniques combinés aux éléments photovoltaïques

**Ta slovenski standard je istoveten z: EN IEC 62109-3:2022**

**ICS:**

27.160	Sončna energija	Solar energy engineering
29.200	Usmerniki. Pretvorniki. Stabilizirano električno napajanje	Rectifiers. Convertors. Stabilized power supply

**SIST EN IEC 62109-3:2023****en,fr,de**



EUROPEAN STANDARD

EN IEC 62109-3

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2022

ICS 27.160

English Version

Safety of power converters for use in photovoltaic power systems - Part 3: Particular requirements for electronic devices in combination with photovoltaic elements  
(IEC 62109-3:2020)

Sécurité des convertisseurs de puissance utilisés dans les systèmes photovoltaïques - Partie 3: Exigences particulières pour les dispositifs électroniques combinés aux éléments photovoltaïques  
(IEC 62109-3:2020)

Sicherheit von Leistungsumrichtern zur Anwendung in photovoltaischen Energiesystemen - Teil 3: Besondere Anforderungen an elektronische Geräte in Kombination mit Photovoltaik-elementen  
(IEC 62109-3:2020)

This European Standard was approved by CENELEC on 2022-09-14. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

<https://standards.iteh.ai/catalog/standards/sist/82a828ab-19a6-4a94-9323-142277701000/iec-62109-3-2020>

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.



European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

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

**EN IEC 62109-3:2022 (E)****European foreword**

The text of document 82/1718/FDIS, future edition 1 of IEC 62109-3, prepared by IEC/TC 82 "Solar photovoltaic energy systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62109-3:2022.

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) 2023-06-14
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2025-09-14

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**

iTeh STANDARD PREVIEW

The text of the International Standard IEC 62109-3:2020 was approved by CENELEC as a European Standard without any modification.

[SIST EN IEC 62109-3:2023](https://standards.iteh.ai/catalog/standards/sist/82a828ab-19a6-4a94-9323-483587f57c8c/sist-en-iec-62109-3-2023)

<https://standards.iteh.ai/catalog/standards/sist/82a828ab-19a6-4a94-9323-483587f57c8c/sist-en-iec-62109-3-2023>

## Annex A (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.cenelec.eu](http://www.cenelec.eu).

*Clause 2 of EN 62109-1:2010 and EN 62109-2:2011 is applicable with the following additions:*

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61215-2	2016	Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 2: Test procedures	EN 61215-2	2017
-	-		+ AC	2017-07
IEC 61730-1	2016	Photovoltaic (PV) module safety qualification - Part 1: Requirements for construction	EN IEC 61730-1	2018
-	-		+ AC	2018-06
IEC 61730-2	2016	Photovoltaic (PV) module safety qualification - Part 2: Requirements for testing	EN IEC 61730-2	2018
-	-		+ AC	2018-06
IEC 61853-2	2016	Photovoltaic (PV) module performance testing and energy rating - Part 2: Spectral responsivity, incidence angle and module operating temperature measurements	EN 61853-2	2016
IEC 62109-1	2010	Safety of power converters for use in photovoltaic power systems - Part 1: General requirements	EN 62109-1	2010
IEC 62109-2	2011	Safety of power converters for use in photovoltaic power systems - Part 2: Particular requirements for inverters	EN 62109-2	2011
IEC 62790	2014	Junction boxes for photovoltaic modules - Safety requirements and tests	EN 62790	2015





IEC 62109-3

Edition 1.0 2020-07

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE



**Safety of power converters for use in photovoltaic power systems –  
Part 3: Particular requirements for electronic devices in combination with  
photovoltaic elements**

**Sécurité des convertisseurs de puissance utilisés dans les systèmes  
photovoltaïques –  
Partie 3: Exigences particulières pour les dispositifs électroniques combinés  
aux éléments photovoltaïques**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

ICS 27.160

ISBN 978-2-8322-8483-4

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references .....	7
3 Terms and definitions .....	8
4 General testing requirements.....	9
4.1 General.....	9
4.2 General conditions for testing .....	16
4.2.1 Sequence of tests.....	16
4.2.2 Reference test conditions .....	18
4.3 Thermal testing.....	18
4.3.2 Maximum temperatures .....	18
4.4 Testing in single fault condition.....	23
4.4.4 Single fault conditions to be applied .....	23
4.8 Additional tests for grid-interactive inverters .....	23
4.300 General requirements regarding protection of the PV element circuit of MIE .....	23
5 Marking and documentation.....	24
5.1 Marking.....	24
5.1.1 General .....	24
5.1.3 Identification.....	24
5.1.4 Equipment ratings.....	25
5.3 Documentation.....	25
5.3.2 Information related to installation.....	25
6 Environmental requirements and conditions.....	25
7 Protection against electric shock and energy hazards.....	25
8 Protection against mechanical hazards.....	25
9 Protection against fire hazards .....	25
10 Protection against sonic pressure hazards.....	26
11 Protection against liquid hazards .....	26
12 Protection against chemical hazards.....	26
13 Physical requirements .....	26
13.4 Internal wiring and connections.....	26
13.4.5 Interconnection between parts of the PCE .....	26
13.9 Fault indication .....	27
13.9.300 Fault indication for MIE.....	27
13.300 Requirements for field assembled MIE .....	27
14 Components.....	27
15 Software and firmware performing safety functions.....	27
Annex A (normative) Alternative method for PV module nominal backsheets temperature ( $T_{NBs}$ ) .....	28
A.1 General.....	28
A.2 Principle .....	28
A.3 Test procedure.....	28

Figure 300 – Test sequence.....	17
Figure 301 – Location of heating pads .....	20
Figure 302 – Test setup for Type B MIE (cross-section view) .....	22
Figure 303 – Test setup for Type A MIE (cross-section view) .....	22
Table 300 – IEC 61730-2:2016 test reference for Type A and Type B MIE .....	11

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN IEC 62109-3:2023](https://standards.iteh.ai/catalog/standards/sist/82a828ab-19a6-4a94-9323-483587f57c8c/sist-en-iec-62109-3-2023)

<https://standards.iteh.ai/catalog/standards/sist/82a828ab-19a6-4a94-9323-483587f57c8c/sist-en-iec-62109-3-2023>

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

—————

**SAFETY OF POWER CONVERTERS  
FOR USE IN PHOTOVOLTAIC POWER SYSTEMS –**
**Part 3: Particular requirements for electronic devices  
in combination with photovoltaic elements**

## 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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62109-3 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

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

FDIS	Report on voting
82/1718/FDIS	82/1737/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 of IEC 62109 series, under the general title, *Safety of power converters for use in photovoltaic power systems*, can be found on the IEC website.

The requirements in this document IEC 62109-3 are to be used with the requirements in IEC 62109-1:2010 and IEC 62109-2:2011. This document IEC 62109-3 supplements or modifies clauses in IEC 62109-1:2010 and IEC 62109-2:2011. When a particular clause or subclause of IEC 62109-1:2010 or IEC 62109-2:2011 is not mentioned in this document IEC 62109-3, that clause of IEC 62109-1:2010 and/or IEC 62109-2:2011 applies. When this document IEC 62109-3 contains clauses that add to, modify, or replace clauses in IEC 62109-1:2010 or IEC 62109-2:2011, the relevant text of IEC 62109-1:2010 and IEC 62109-2:2011 is to be applied with the required changes.

Subclauses, figures and tables additional to those in IEC 62109-1:2010 and IEC 62109-2:2011 are numbered starting from 300 to indicate that they are introduced in this document IEC 62109-3.

NOTE For example, new level 2 subclauses in clause 5 would be numbered 5.300, 5.301, etc. New level 4 subclauses in subclause 7.3.201 would be numbered 7.3.201.300, 7.3.201.301, etc.

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.

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

<http://standards.iteh.ai/catalog/standards/sist/82e828ab-10c6-4a94-9373-483587f57c8c/sist-en-iec-62109-3-2023>

The contents of the corrigendum of November 2020 have been included in this copy.

## INTRODUCTION

This part 3 of IEC 62109 gives requirements for products which consist of an electronic element and a PV element or PV module. For this type of equipment, specific safety aspects must be considered that arise from the combination of these two product types. This part 3 gives safety requirements by: referring to other parts of IEC 62109 and to PV module standards like IEC 61730, defining tests and requirements that are in addition to these product standards of the sub elements, defining modifications to the test procedures in IEC 62109 and IEC 61730, and providing guidance to apply these tests to the combination of PV module and electronics.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN IEC 62109-3:2023](https://standards.iteh.ai/catalog/standards/sist/82a828ab-19a6-4a94-9323-483587f57c8c/sist-en-iec-62109-3-2023)

<https://standards.iteh.ai/catalog/standards/sist/82a828ab-19a6-4a94-9323-483587f57c8c/sist-en-iec-62109-3-2023>