



Edition 3.0 2025-10

# INTERNATIONAL STANDARD

# **Document Preview**

IEC 60364-7-712:2025

https://standards.iteh.ai/catalog/standards/iec/4b324c2f-1b95-4ee2-9108-f59e2c08808f/iec-60364-7-712-2025



# THIS PUBLICATION IS COPYRIGHT PROTECTED Copyright © 2025 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat Tel.: +41 22 919 02 11

3, rue de Varembé info@iec.ch CH-1211 Geneva 20 www.iec.ch

Switzerland

#### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

#### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

#### IEC publications search -

#### webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

# **IEC Just Published - webstore.iec.ch/justpublished**Stay up to date on all new IEC publications. Just Published

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

#### IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@jec.ch.

#### IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

#### Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

**Preview** 

<u> IEC 60364-7-712:2025</u>

https://standards.iteh.ai/catalog/standards/iec/4b324c2f-1b95-4ee2-9108-f59e2c08808f/iec-60364-7-712-202f

## **CONTENTS**

FOREWORD.		3
INTRODUCTI	ON	5
712 Solar pho	otovoltaic (PV) power supply installations	6
712.1 Sco	pe	6
712.2 Nor	mative references	6
712.3 Ter	ms, definitions and symbols	8
712.31 Pur	poses, supplies and structure	13
712.4 Pro	tection for safety	25
712.41 Pro	tection against electric shock	25
712.410	Introduction	25
712.411	Protective measure: automatic disconnection of supply	26
712.412	Protective measure: double or reinforced insulation	29
712.414	Protective measure: extra-low-voltage provided by SELV and PELV	30
712.42 Pro	tection against thermal effects	30
712.421	Protection against fire caused by electrical equipment	30
712.430	Protection against overcurrent	32
712.44 Pro	tection against voltage disturbances and electromagnetic disturbances	36
712.443	Protection against transient overvoltages of atmospheric origin or due	
	witching	
	ection and erection of el <mark>ectrical equipment</mark>	
	mmon rules	37
712.510	Introduction	37
712.511	Compliance with standards	
712.512	Operational conditions and external influences	
712.513	Accessibility	
712.514	Identification	
712.515 standards.iteh.	Prevention of mutual detrimental influence	64-7 <mark>-7</mark> 12-202
	ing systems	
712.521	Types of wiring system	42
712.522	Selection and erection of wiring systems in relation to external uences	45
712.523	Current-carrying capacities	
712.524	Cross-sectional areas of conductors	
712.526	Electrical connections.	
712.527	Selection and erection of wiring systems to minimize spread of fire	
	vices for protection for safety, isolation, switching, control and monitoring.	
712.531	Equipment for protection against electric shock	
712.532	Devices and precautions for protection against thermal effects	
712.533	Devices for protection against overcurrent	
712.534	Devices for protection against transient overvoltages	
712.536	Isolation and switching	
712.537	Monitoring	
	thing arrangements and protective conductors	
712.542	Earthing arrangements	
712.544	Protective bonding conductors	
	er equipment	
	ification	

Annex A (normative) Calculation of $U_{\mbox{OC MAX}}$ and $I_{\mbox{SC MAX}}$	58
A.1 Calculation of $U_{\hbox{\scriptsize OC MAX}}$	58
A.2 Calculation of I <sub>SC MAX</sub>	
Annex B (informative) Performance issues	60
Annex C (informative) Further examples of architecture configurations	
Annex D (normative) Current carrying capacities of PV cables – Temperature correction factors	
Annex E (informative) List of notes concerning certain countries	
Bibliography	
Figure 1 – General functional configuration of a PV installation with energy storage	14
Figure 2 – DCU string: defined by output of DC/DC converters in serial connection	15
Figure 3 – PCE using an external transformer	16
Figure 4 – Example of PV array diagram – Single string case	18
Figure 5 – Example of PV array diagram – Multiple parallel string case	19
Figure 6 – Example of PV array diagram – Multiple parallel DCU string case	20
Figure 7 – Example of PV array diagram – Multiple parallel string case with array divided into sub-arrays	21
Figure 8 – Example of PV array using PCE with multiple separate DC inputs	22
Figure 9 – Example of PV array using PCE with multiple DC inputs internally connected to a common DC bus	
Figure 10 – Example of fault protection on DC bus circuit using an IT system	
Figure 11 – Example of fault protection on DC bus circuit with non-separated PCE connected to a TT or TN system	
Figure 12 – Example of fault protection on DC bus circuit with separated PCE using a TT or TN system	
Figure 13 – Example of a PV array diagram where strings are grouped under one OCPD per group	
Figure 14 – Example of a sign indicating the presence of a photovoltaic installation	
Figure 15 – Example of PV string wiring and DCU string wiring with minimum loop area	43
Figure 16 – String wiring harness	44
Figure C.1 – Further architecture configurations of the DC bus	
Figure D.1 – 98 <sup>th</sup> percentile temperature for an open-rack, or thermally unrestricted, glass superstrate, polymer backsheet module	
Figure D.2 – 98 <sup>th</sup> percentile temperature for a close-roof mounted glass superstrate, polymer backsheet module	64
Table 1 – Calculation of the critical length $L_{\text{crit}}$	37
Table 2 – Minimum current rating of circuits	46
Table 3 – Isolation devices in PV array installations	
Table 4 – Minimum insulation resistance thresholds for detection of failure of insulation to earth	
Table 5 – Response time limits for sudden changes in residual current	
Table D.1 – Current carrying capacity of PV cables	
Table D.2 – Current rating conversion factors for different ambient temperatures	
Table E.1 – List of notes concerning certain countries	

#### INTERNATIONAL ELECTROTECHNICAL COMMISSION

# Low-voltage electrical installations Part 7-712: Requirements for special installations or locations Solar photovoltaic (PV) power supply installations

#### **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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 60364-7-712 has been prepared by IEC technical committee 64: Electrical installations and protection against electric shock. It is an International Standard.

This third edition cancels and replaces the second 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 technical content has been extensively revised and expanded, taking into account experience gained in the construction and operation of PV installations, and developments made in technology, since the second edition was published.
- b) Key changes include requirements for PV power generation plants, direct connection to battery circuits, introduction of DC bus circuit and DCUs.

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

Draft	Report on voting
64/2765/FDIS	64/2785/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 <a href="https://www.iec.ch/members\_experts/refdocs">www.iec.ch/members\_experts/refdocs</a>. The main document types developed by IEC are described in greater detail at <a href="https://www.iec.ch/publications">www.iec.ch/publications</a>.

A list of all parts in the IEC 60364 series, published under the general title *Low-voltage electrical installations*, can be found on the IEC website.

The reader's attention is drawn to the fact that Annex E lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this document.

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.

(https://standards.iteh.ai)

**Document Preview** 

IEC 60364-7-712:2025

https://standards.iteh.ai/catalog/standards/iec/4h324c2f-1h95-4ee2-9108-f59e2c08808f/iec-60364-7-712-202

#### INTRODUCTION

For the purposes of this part of IEC 60364 (IEC 60364-7-712), the requirements of the general Part 1 to Part 6 and Part 8 of IEC 60364 apply.

The IEC 60364-7-7XX parts of IEC 60364 contain particular requirements for special installations or locations which are based on the requirements of the general parts of IEC 60364 (IEC 60364-1 to IEC 60364-6 and IEC 60364-8). These IEC 60364-7-7XX parts are considered in conjunction with the requirements of the general parts.

The particular requirements of this document supplement, modify or replace certain of the requirements of the general parts of IEC 60364 being valid at the time of publication of this document. The absence of reference to the exclusion of a part or a clause of a general part means that the corresponding clauses of the general part are applicable (undated references).

Requirements of other IEC 60364-7XX parts being relevant for installations covered by this document also apply. This document can therefore also supplement, modify or replace certain of these requirements valid at the time of publication of this document.

The clause numbering of this document follows the pattern and corresponding references of IEC 60364. The numbers following the particular number of this document are those of the corresponding parts, or clauses of the other parts of the IEC 60364 series, valid at the time of publication of this document, as indicated in the normative references of this document (dated references). If requirements or explanations additional to those of the other parts of the IEC 60364 series are necessary, the numbering of such items appears as 712.101, 712.102, 712.103, etc.

In the case where new or amended general parts with modified numbering were published after this document was issued, it is possible that the clause numbers referring to a general part in this document will possibly no longer align with the latest edition of the general part. Dated references should be observed.

Attention is drawn to the co-existence of IEC 60364-7-712 and IEC 62548-1. Both standards have been developed in close coordination by different technical committees.