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Photovoltaic (PV) arrays – Design requirements

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 62548, which is a technical specification, has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

The present Technical Specification is intended to be withdrawn as soon as an International Standard in the IEC 60364 series, under joint development by IEC technical committees 64 and 82, will be published.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
82/746/DTS	82/765A/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

- transformed into an International Standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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PHOTOVOLTAIC (PV) ARRAYS – DESIGN REQUIREMENTS

1 Scope and object

This Technical Specification sets out design requirements for photovoltaic (PV) arrays including d.c. array wiring, electrical protection devices, switching and earthing provisions. The scope includes all parts of the PV array up to but not including energy storage devices, power conversion equipment or loads.

The object of this Technical Specification is to address the design safety requirements arising from the particular characteristics of photovoltaic systems. Direct current systems, and PV arrays in particular, pose some hazards in addition to those derived from conventional a.c. power systems, including the ability to produce and sustain electrical arcs with currents that are not greater than normal operating currents.

In grid connected systems the safety requirements of this Technical Specification are however critically dependent on the inverters associated with PV arrays complying with the requirements of IEC 62109-1 and IEC 62109-2.

Installation requirements are also critically dependent on compliance with IEC 60364 series (see Clause 4).

PV arrays of less than 100 W and less than 35 V d.c. open circuit voltage at STC are not covered by this Technical Specification.

Attention is drawn to Annex D describing arc fault detection and interruption in PV arrays. It is expected that requirements for the use of this type of equipment will be included in this Technical Specification when reliable commercial equipment for detection of arcs in PV systems is available.

NOTE 1 This Technical Specification covers the protection requirements of PV arrays which develop as a result of the use of batteries in PV systems.

NOTE 2 Additional requirements may be needed for more specialized installations e.g. concentrating systems, tracking systems or building integrated PV.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60228:2004, *Conductors of insulated cables*

IEC 60269-6, *Low-voltage fuses – Part 6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems*

IEC 60287 (all parts), *Electric cables – Calculation of the current rating*

IEC 60332-1-2:2004, *Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame*

IEC 60364 (all parts), *Low-voltage electrical installations*

IEC 60364-4-41:2005, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60364-5-54:2011, *Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors*

IEC 60364-7-712:2002, *Electrical installations of buildings – Part 7-712: Requirements for special installations or locations – Solar photovoltaic (PV) power supply systems*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60898-2, *Circuit-breakers for overcurrent protection for household and similar installations – Part 2: Circuit-breakers for a.c. and d.c. operation*

IEC 60947-1, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60947-2, *Low-voltage switchgear and controlgear – Part 2: Circuit breakers*

IEC 60947-3, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*

IEC 61215:2005, *Crystalline silicon terrestrial photovoltaic (PV) modules – Design qualification and type approval*

IEC 61646, *Thin-film terrestrial photovoltaic (PV) modules – Design qualification and type approval*

IEC 61730-1:2004, *Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction*

IEC 61730-2:2004, *Photovoltaic (PV) module safety qualification – Part 2: Requirements for testing*

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

IEC 62109-2, *Safety of power converters for use in photovoltaic power systems – Part 2: Particular requirements for inverters*

IEC 62305-2, *Protection against lightning – Part 2: Risk management*

IEC 62305-3, *Protection against lightning – Part 3: Physical damage to structures and life hazard*

IEC 62305-4, *Protection against lightning – Part 4: Electrical and electronic systems within structures*

IEC 62446, *Grid connected photovoltaic systems – Minimum requirements for system documentation, commissioning tests and inspection*

EN 50521, *Connectors for photovoltaic systems – Safety requirements and tests*