

SINGAPORE STANDARD

**Safety of power converters for use in
photovoltaic (PV) power systems**

– Part 1 : General requirements

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(PV) power systems**

– Part 1 : General requirements

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	Dr Tan Yen Kheng	
	Dr Timothy Michael Walsh	<i>National University of Singapore</i>
	Mr Yee Peng Huey	<i>JTC Corporation</i>
Co-opted Member	: Er. Peter Toi	<i>Individual Capacity</i>

The Working Group, appointed by the Technical Committee to assist in the preparation of this standard, comprises the following experts who contribute in their *individual capacity*:

Name

Co-Convenors	: Dr Timothy Michael Walsh
	Er. Lim Ah Hee
Members	: Mr Jonathan Cheng
	Prof Er Meng Joo
	Mr Ettanoor Thuppale Mohan Dass
	Ms Kavita Gandhi
	Dr Jiang Hao
	Mr Christopher Hee
	Mr Christophe Inglin
	Mr Albert Lim
	Mr Liu Yuanjie
	Mr Pang Tong Teck
	Mr Tan Lee Heng
	Mr Tan Teck Cheng
	Er. Wan Fook Sing
	Mr Vincent Wiguna
	Ms Joanne Wong
	Er. Wong Kum Hoong
	Mr Wong Lip Pang

The organisations in which the experts of the Working Group are involved are:

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National Foreword

This Singapore Standard was prepared by a Working Group appointed by the Technical Committee on Power Systems and Utilisation under the direction of the Electrical and Electronic Standards Committee.

This standard is an identical adoption of International Standard IEC 62109-1 : 2010, 'Safety of power converters for use in photovoltaic power systems – Part 1: General requirements' published by the International Electrotechnical Commission.

Attention is drawn to the following:

1. Where appropriate, the words 'International Standard' shall be read as 'Singapore Standard'. The reference to 'IEC 62109-2' shall be replaced by 'SS IEC 62109-2'.
2. The comma has been used throughout as a decimal marker whereas in Singapore Standards it is a practice to use a full point on the baseline as the decimal marker.
3. The amendments in the SS IEC 62109-1 are incorporated without tracked changes for ease of reference by the users of the standard.

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

NOTE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SAFETY OF POWER CONVERTERS FOR USE
IN PHOTOVOLTAIC POWER SYSTEMS –**

Part 1: General requirements

FOREWORD

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International Standard IEC 62109-1 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

The text of this standard is based on the following documents:

FDIS	Report on voting
82/593/FDIS	82/597/RVD

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

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 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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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

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.

INTRODUCTION

This Part of IEC 62109 specifies the safety requirements that are generally applicable to all equipment within its scope. For certain types of equipment, these requirements will be supplemented or modified by the special requirements of one or more subsequent parts (for example IEC 62109-2, IEC 62109-3, etc.) of the standard which must be read in conjunction with the Part 1 requirements.

SAFETY OF POWER CONVERTERS FOR USE IN PHOTOVOLTAIC POWER SYSTEMS –

Part 1: General requirements

1 Scope and object

1.1 Scope

This part of IEC 62109 applies to the power conversion equipment (PCE) for use in Photovoltaic (PV) systems where a uniform technical level with respect to safety is necessary. This standard defines the minimum requirements for the design and manufacture of PCE for protection against electric shock, energy, fire, mechanical and other hazards.

This standard provides general requirements applicable to all types of PV PCE. There are additional parts of this standard that provide specific requirements for the different types of power converters, such as Part 2 - inverters. Additional parts may be published as new products and technologies are commercialised.

1.1.1 Equipment included in scope

This standard covers PCE connected to systems not exceeding maximum PV source circuit voltage of 1 500 V d.c. The equipment may also be connected to systems not exceeding 1 000 V a.c. at the a.c. mains circuits, non-mains a.c. load circuits, and to other DC source or load circuits such as batteries. This standard may be used for accessories for use with PCE, except where more appropriate standards exist.

Evaluation of PCE to this standard includes evaluation of all features and functions incorporated in or available for the PCE, or referred to in the documentation provided with the PCE, if such features or functions can affect compliance with the requirements of this standard.

1.1.2 Equipment for which other requirements may apply

This standard has not been written to address characteristics of power sources other than photovoltaic systems, such as wind turbines, fuel cells, rotating machine sources, etc.

NOTE 1 Requirements for other sources may be incorporated in the IEC 62109 series in the future.

Additional or other requirements are necessary for equipment intended for use in explosive atmospheres (see IEC 60079), aircraft, marine installations, electromedical applications (see IEC 60601) or at elevations above 2 000 m.

NOTE 2 Requirements are included for adjustment of clearance distances for higher elevations, but not for other factors related to elevation, such as thermal considerations

1.2 Object

1.2.1 Aspects included in scope

The purpose of the requirements of this part of IEC 62109 is to ensure that the design and methods of construction used provide adequate protection for the operator and the surrounding area against:

- a) electric shock and energy hazards;
- b) mechanical hazards;
- c) excessive temperature hazards;
- d) spread of fire from the equipment;
- e) chemical hazards;
- f) sonic pressure hazards;
- g) liberated fluids, gases and explosion hazards.

NOTE Servicing personnel are expected to have the necessary knowledge and skill to use reasonable care in dealing with hazards associated with the operation, repair and maintenance of this equipment. Based upon this premise, this standard provides only limited requirements (for example markings or guarding) intended to protect service personnel from hazards that may not be apparent even to trained personnel.

1.2.2 Aspects excluded from scope

Aspects not covered by this standard include, but are not limited to, the following:

- a) functional reliability, performance or other properties of the equipment not related to safety;
- b) effectiveness of transport packaging;
- c) EMC requirements;
- d) installation requirements, which are covered by local and national installation codes.

NOTE This standard does provide requirements for PCE intended to ensure that the PCE can be installed in a safe manner, including requirements for installation instructions provided with the product.

2 Normative references

The following referenced documents are indispensable for the application 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 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60085, *Electrical insulation – Thermal evaluation and designation*

IEC 60112, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60216-1, *Electrical insulating materials – Properties of thermal endurance – Part 1: Ageing procedures and evaluation of test results*

IEC 60216-2, *Electrical insulating materials – Thermal endurance properties – Part 2: Determination of thermal endurance properties of electrical insulating materials – Choice of test criteria*

IEC 60216-3, *Electrical insulating materials – Thermal endurance properties – Part 3: Instructions for calculating thermal endurance characteristics*

IEC 60216-4-1, *Electrical insulating materials – Thermal endurance properties – Part 4-1: Ageing ovens – Section 1: Single-chamber ovens*

IEC 60216-5, *Electrical insulating materials – Thermal endurance properties – Part 5: Determination of relative thermal endurance index (RTE) of an insulating material*

IEC 60216-6, *Electrical insulating materials – Thermal endurance properties – Part 6: Determination of thermal endurance indices (TI and RTE) of an insulating material using the fixed time frame method*

IEC 60227-1:2007, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 1: General requirements*

IEC 60245-1:2003, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 1: General requirements*

IEC 60309 (all parts), *Plugs, socket-outlets and couplers for industrial purposes*

IEC 60320 (all parts), *Appliances couplers for household and similar general purposes*

IEC 60364-1:2005, *Low-voltage electrical installations – Part 1: Fundamental principles, assessment of general characteristics, definitions*

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