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TECHNICAL SPECIFICATION

Renewable energy and hybrid systems for rural electrification – Part 9-8: Integrated systems – Requirements for stand-alone renewable energy products with power ratings less than or equal to 350 W

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

IEC TS 62257-9-8, which is a Technical Specification, has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

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

Enquiry draft	Report on voting
82/1643/DTS	82/1685/RVDTS 82/1685A/RVDTS

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

This part of IEC 62257 is to be used in conjunction with IEC TS 62257-9-5.

A list of all parts in the IEC 62257 series, published under the general title *Renewable energy and hybrid systems for rural electrification*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

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- withdrawn,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.

INTRODUCTION

IEC 62257 (all parts) provides support and strategies for institutions involved in rural electrification projects. It documents technical approaches for designing, building, testing, and maintaining off-grid renewable energy and hybrid systems with AC nominal voltage below 500 V, DC nominal voltage below 750 V and nominal power below 100 kVA.

These documents are recommendations to support buyers who want to connect with good quality options in the market:

- to choose the right system for the right place,
- to design the system, and
- to operate and maintain the system.

These documents are focused only on technical aspects of rural off-grid electrification concentrating on, but not specific to, developing countries. They are not considered as all inclusive to rural electrification. The documents do not describe a range of factors that can determine project or product success: environmental, social, economic, service capabilities, and others. Further developments in this field could be introduced in future steps.

This consistent set of documents is best considered as a whole with different parts corresponding to items for safety, sustainability of systems, and costs. The main objectives are to support the capabilities of households and communities that use small renewable energy and hybrid off-grid systems and inform organizations and institutions in the off-grid power market.

The purpose of this document is to provide baseline standards for quality, durability and truth-in-advertising to protect consumers of stand-alone renewable energy products. This document is specifically related to renewable energy products that are packaged and made available to end-use consumers at the point of purchase as single, stand-alone products that do not require additional system components to function. This document applies to products with peak power ratings of 350 W or less. While most provisions apply to all products in this range, a few are applicable only to products with peak power ratings greater than 10 W and less than or equal to 350 W.

The term "stand-alone renewable energy product" is used in this document to describe this class of products. Other equivalent terms, including "off-grid solar" or "rechargeable," are often used by manufacturers, distributors, and other stakeholders to describe these products. Many of these systems meet the definition of type T_2I (individual electrification systems with energy storage) in IEC TS 62257-2.

The intended users of this document are:

- market support programmes that support the off-grid lighting market with financing, consumer education, awareness, and other services;
- manufacturers and distributors that need to verify the quality and performance of products;
- bulk procurement programmes that facilitate or place large orders of products; and,
- trade regulators such as government policymakers and officials who craft and implement trade and tax policy.

This document establishes minimum requirements for quality standards and warranty requirements. Products are compared to specifications based on test results from IEC TS 62257-9-5 and other information about the product. The requirements are designed to be widely applicable across different markets, countries, and regions.

RENEWABLE ENERGY AND HYBRID SYSTEMS FOR RURAL ELECTRIFICATION –

Part 9-8: Integrated systems – Requirements for stand-alone renewable energy products with power ratings less than or equal to 350 W

1 Scope

This part of IEC 62257 provides baseline requirements for quality, durability and truth in advertising to protect consumers of off-grid renewable energy products. Evaluation of these requirements is based on tests described in IEC TS 62257-9-5. This document can be used alone or in conjunction with other international standards that address the safety and durability of components of off-grid renewable energy products.

This document applies to stand-alone renewable energy products having the following characteristics:

- The products are powered by photovoltaic (PV) modules or electromechanical power generating devices (such as dynamos), or are designed to use grid electricity to charge a battery or other energy-storage device for off-grid use. The requirements may also be appropriate as guidance for evaluating the quality of devices with other power sources, such as thermoelectric generators.
- The peak power rating of the PV module or other power generating device is less than or equal to 350 W.
- All components required to provide basic energy services are sold/installed as a kit, included as a part of family of products as defined in 4.2.5, or integrated into a single component, including at a minimum:
  - a battery/batteries or other energy storage device(s);
  - power generating device, such as a solar panel, capable of charging the battery/batteries or other energy storage device(s);
  - cables, switches, wiring, connectors and protective devices sufficient to connect the power generating device, power control unit(s) and energy storage device(s).
- The system evaluated includes all the loads (lighting, television, radio, fan, etc.) and load adapter cables that are sold or included as part of the kit or integrated into kit components.
- The PV module maximum power point voltage and the working voltage of any other components in the kit do not exceed 35 V. Exceptions are made for AC-to-DC converters that meet appropriate safety standards. Systems that include PV modules (or combinations of PV modules) with ratings that exceed 240 W at peak power, 35 V at open circuit or 8 A at short circuit are subject to additional safety requirements beyond those assessed in IEC TS 62257-9-5.

NOTE This voltage limit corresponds to the definition of decisive voltage classification A (DVC-A) for wet locations in Table 6 of IEC 62109-1:2010. The limits of 240 W, 35 V and 8 A are consistent with the definition of Class III in IEC 61730-1.

- These requirements cover only DC outputs and loads. Products that include inverters, AC outputs/outlets, or AC appliances are not within the scope of this document. Products can have AC inputs.
- No design expertise is required to choose appropriate system components.
- All electrical connections, except for permanent connections made at the time of installation, can be made using plug-and-socket connectors without the use of any tools. All connections made in the field are straightforward to make and do not require technical expertise, such as wrapping wire in a specific direction, soldering, or crimping.

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 60364-7-712, *Low voltage electrical installations – 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 60904-9, *Photovoltaic devices – Part 9: Solar simulator performance requirements*

IEC 61215 (all parts), *Terrestrial photovoltaic (PV) modules – Design qualification and type approval*

IEC 61215-2, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 2: Test procedures*

IEC 61730 (all parts). *Photovoltaic (PV) module safety qualification*

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

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

IEC TS 61836, *Solar photovoltaic energy systems – Terms, definitions and symbols*

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

IEC 62133-2, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary lithium cells, and for batteries made from them, for use in portable applications – Part 2: Lithium systems*

IEC TS 62257-9-5, *Recommendations for renewable energy and hybrid systems for rural electrification: Integrated systems – Laboratory evaluation of stand-alone renewable energy products for rural electrification*

IEC TS 62257-12-1, *Recommendations for renewable energy and hybrid systems for rural electrification – Part 12-1: Selection of lamps and lighting appliances for off-grid electricity systems*

IEC 62281, *Safety of primary and secondary lithium cells and batteries during transport*

IEC 62619, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications*

IEC 62930, *Electric cables for photovoltaic systems with a voltage rating of 1,5 kV DC*

ISO 4892, *Plastics – Methods of exposure to laboratory light sources*

EN 50618, *Electric cables for photovoltaic systems*

HD 605, *Electric cables – Additional test methods*

UL 1741, *Standard for inverters, converters, controllers and interconnection system equipment for use with distributed energy resources*

UL 1973, *Standard for batteries for use in stationary, vehicle auxiliary power and light electric rail (LER) applications*

UL 2054, *Standard for Household and Commercial Batteries*

UL 62133, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications*

United Nations. *Recommendations on the transport of dangerous goods: manual of tests and criteria*