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TECHNICAL SPECIFICATION

Recommendations for renewable energy and hybrid systems for rural electrification –
Part 9-5: Integrated systems – Selection of stand-alone lighting kits for rural electrification

INTERNATIONAL
ELECTROTECHNICAL
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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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 62257-9-5, which is a Technical Specification, has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This third edition cancels and replaces the second edition issued in 2013. It constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) The battery test methods have been updated to harmonize with existing IEC standards, add safety guidance, and remove test methods for nickel-cadmium batteries (as proper disposal options are not available in many communities).
b) The sequence of testing has been changed to allow the battery to be charged using the product's charge controller prior to the full-battery run time test.
c) Limits on total series resistance of the test apparatus have been added to test procedures.
d) Language has been added throughout to facilitate the testing of systems with appliances, including non-lighting appliances such as radios.
e) An alternative lumen maintenance test procedure using IESNA LM80-08 test data has been added.
f) Methods have been added for testing water and physical ingress protection for photovoltaic modules.
g) Procedures have been added for powering light points directly from a power supply during the lumen maintenance, light output, and light distribution tests.
h) Equipment requirements and recommended equipment specifications have been consolidated into the new Annex CC.
i) New optional test methods have been added to assess robustness to faults (Annex DD), characterize DC ports (Annex EE) and appliances (Annex FF), and synthesize test results to estimate the energy service capabilities and evaluate advertising claims for systems with multiple appliances (Annex GG).

This part of IEC 62257 is to be used in conjunction with the IEC 62257 (all parts).

The text of this Technical Specification is based on the following documents:

Enquiry draft	Report on voting
82/1051/DTS	82/1115/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.

A list of all parts in the IEC 62257 series, published under the general title *Recommendations for 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 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.

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

IEC 62257 (all parts) provides support and strategies for and 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 part of IEC 62257 is to specify quality assurance strategies for stand-alone lighting kits, including product specifications, tests, and a standardized specification sheet format. In addition to supporting the selection of products by project developers and implementers, quality assurance can help market support organizations, manufacturers, and governments achieve the goals they have for off-grid lighting projects.

The intended users of this part of IEC 62257 are listed below. In some clauses and subclauses of this part of IEC 62257, a description of the application of the subclause contents is offered to help provide context for each type of user.

a) Market support programmes are programmes that support the off-grid lighting market with financing, consumer education, awareness, and other services. Market support programmes often use quality assurance to qualify for access to services such as:
   - greenhouse gas reduction certifications or other incentives,
   - access to financing (trade or consumer finance),
   - use of a buyer seal and certification (government or non-governmental institutional backing, consumer or "business to business" seals),
   - participation in a public product information database (e.g. standardized specification sheets),
   - access to a business network or trade group,
   - business support and development services,
   - access to market intelligence, and
   - participation in consumer awareness campaigns.

b) Manufacturers and distributors need to verify the quality and performance of products from different batches and potential business partners. Manufacturers and distributors often use quality assurance plans or requirements to:

- support quality control processes at a manufacturing plant or upon receipt of goods from a contract manufacturer, and
- choose products to distribute.

c) Bulk procurement programmes facilitate or place large orders for devices from a distributor or manufacturer. Bulk procurement programmes may use quality assurance to:

- provide devices to a particular, relatively small group of end users whose needs are understood (e.g., project developers and implementers for an electrification project may include quality assurance requirements in the GS of an electrification project (see IEC TS 62257-3)), and
- organize a subsidy, buy-down, or giveaway programme that will serve a broad set of users.

d) Trade regulators are typically government policymakers and officials who craft and implement trade and tax policy. Regulators may use quality assurance requirements to:

- qualify for exemption from tax or duties, and
- establish requirements for customs.

This part of IEC 62257 establishes the framework for creating a product specification, the basis for evaluating quality for a particular context. Product specifications include minimum requirements for quality standards and warranty requirements. Products are compared to specifications based on test results and other information about the product. The product specification framework is flexible and can accommodate the goals of diverse organizations and institutions.

There is a range of tests outlined in this part of IEC 62257; some are simple enough to be completed in the field by project developers while others require laboratory equipment. The tests and inspections are designed to be widely applicable across different markets, countries, and regions.

Standardized specification sheets are also defined that can be used to communicate the test results. Combined with a set of product specifications, the information in the standardized specification sheet can inform the use of a quality and/or performance label.

RECOMMENDATIONS FOR RENEWABLE ENERGY AND HYBRID SYSTEMS FOR RURAL ELECTRIFICATION –

Part 9-5: Integrated systems – Selection of stand-alone lighting kits for rural electrification

1 Scope

This part of IEC 62257, which is a Technical Specification, applies to stand-alone rechargeable electric lighting appliances or kits that can be installed by a typical user without employing a technician.

This part of IEC 62257 presents a quality assurance framework that includes product specifications (a framework for interpreting test results), test methods, and standardized specification sheets (templates for communicating test results).

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

IEC 60891:2009, *Photovoltaic devices – Procedures for temperature and irradiance corrections to measured I-V characteristics*

IEC 60904-1:2006, *Photovoltaic devices – Part 1: Measurement of photovoltaic current-voltage characteristics*

IEC 61056-1:2012, *General purpose lead-acid batteries (valve-regulated types) – Part 1: General requirements, functional characteristics – Methods of test*

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

IEC 61427-1:2013, *Secondary cells and batteries for renewable energy storage – General requirements and methods of test – Part 1: Photovoltaic off-grid application*

IEC 61672-1, *Electroacoustics – Sound level meters – Part 1: Specifications*

IEC 61951-2:2011, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Portable sealed rechargeable single cells – Part 2: Nickel-metal hydride*

IEC 61960:2011, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for portable applications*

IEC 62087-1:2015, *Audio, video, and related equipment – Determination of power consumption – Part 1: General*

IEC 62087-2:2015, *Audio, video, and related equipment – Determination of power consumption – Part 2: Signals and media*

IEC 62087-3:2015, *Audio, video, and related equipment – Determination of power consumption – Part 3: Television sets*

CIE 15:2004, *Colorimetry*

CIE 084, *The measurement of luminous flux*

CIE 13.3, *Method of measuring and specifying colour rendering properties of light sources*

CIE 127, *Measurement of LEDs*

CIE 177, *Colour rendering of white LED light sources*

IESNA LM-78-07, *IESNA approved method for total luminous flux measurement of lamps using an integrating sphere photometer*

IESNA LM-79-08, IES approval method for *electrical and photometric measurements of solid state lighting products*

IESNA LM-80-08, *Approved method: measuring lumen maintenance of LED light sources*