

# TECHNICAL SPECIFICATION

**Recommendations for renewable energy and hybrid systems for rural  
electrification –  
Part 12-1: Laboratory evaluation of lamps and lighting appliances for off-grid  
electricity systems**

IEC TS 62257-12-1:2020

<https://standards.iteh.ai/catalog/standards/sist/a42dba4f-1126-4bf4-bcc9-76ad5ef7edde/iec-ts-62257-12-1-2020>



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COMMISSION

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ICS 27.160

ISBN 978-2-8322-8077-5

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RECOMMENDATIONS FOR RENEWABLE ENERGY  
AND HYBRID SYSTEMS FOR RURAL ELECTRIFICATION –****Part 12-1: Laboratory evaluation of lamps and  
lighting appliances for off-grid electricity systems**

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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 62257-12-1, 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 published in 2015. This edition constitutes a technical revision.

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

Title modified.

- Annex A and Annex B were combined into a single Annex A to eliminate duplicate tables and simplify the document. Annex A in this third edition now covers recommendations and requirements for both market support programmes and bulk procurement programs. Annex A provides specific examples for quality standards, warranty requirements, and performance criteria for off-grid lighting products.

This Technical Specification is to be used in conjunction with other parts of the IEC 62257 series.

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

Enquiry draft	Report on voting
82/1617/DTS	82/1642A/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 publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 62257 series 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 website 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.

## INTRODUCTION

The IEC 62257 series provides support and strategies for organizations 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 1 000 V, and DC nominal voltage below 1 500 V.

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,
- 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 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 affordable 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 specify laboratory test methods for evaluating the quality assurance of lamps and lighting appliances for off-grid electricity systems, including product specifications and tests. 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 lighting appliances in off-grid applications.

This part of IEC 62257 presents a quality assurance framework that includes product specifications (a framework for interpreting test results) and test methods.

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.

The tests and inspections are designed to be widely applicable across different markets, countries, and regions.

# RECOMMENDATIONS FOR RENEWABLE ENERGY AND HYBRID SYSTEMS FOR RURAL ELECTRIFICATION –

## Part 12-1: Laboratory evaluation of lamps and lighting appliances for off-grid electricity systems

### 1 Scope

This part of IEC 62257 establishes the framework for creating a product specification for lamps and lighting appliances to serve as the basis for evaluating quality for a particular context. Product specifications include minimum requirements for quality standards, warranty requirements, and/or performance criteria. 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.

This document applies to lamps and lighting appliances for off-grid electricity systems that have the following characteristics:

- The power supply is AC or DC:
  - AC nominal voltages up to 250 V;
  - DC nominal voltages up to 48 V.
- The light source is CFL, linear fluorescent, or LED.
- Operation of the lamp or lighting appliance does not require any components to be supplied by the testing laboratory other than lampholders, wire, connectors, and a power supply.
- The lamp or lighting appliance does not include a battery or energy source (for example, a photovoltaic module or electromechanical generator).

Luminaires are included in the definition of “lighting appliances” if packaged together with a lamp intended to be used with the luminaire. Luminaires without lamps are not included in the scope of this document.

### 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 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

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

IEC 60598-1, *Luminaires – Part 1: General requirements and tests*

IEC 60598-2-1, *Luminaires – Part 2-1: Particular requirements – Fixed general purpose luminaires*

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

IEC TS 62257-9-5: 2018, *Recommendations for renewable energy and hybrid systems for rural electrification – Part 9-5: Integrated systems – Laboratory evaluation of stand-alone renewable energy products for rural electrification*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions in IEC TS 61836 apply, as well as the following.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

#### 3.1

##### **environmental conditions**

characteristics, such as elevation, temperature, and humidity, that can influence performance

#### 3.2

##### **lux**

SI unit of illuminance: illuminance produced on a surface of area 1 square metre by a luminous flux of 1 lumen uniformly distributed over that surface

[SOURCE: IEC 60050-845:1987, 845-01-52]

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#### 3.3

##### **illuminance**

##### **illuminance of an elementary surface**

*E*

luminous flux received by an elementary surface divided by the area of this surface

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Note 1 to entry: In the SI system of units illuminance is expressed in lux (lx) or lumens per square metre (lm/m<sup>2</sup>).

[SOURCE: IEC 60050-723:1997, 723-08-30]

#### 3.4

##### **luminous efficacy**

##### **luminous efficacy of a source**

quotient of the luminous flux emitted by the power consumed by the source

Note 1 to entry: Unit: lm/W.

[SOURCE: IEC 60050-845:1987, 845-01-55]

#### 3.5

##### **full width half maximum**

##### **FWHM**

range of a variable over which a given characteristic is greater than 50 % of its maximum value

Note 1 to entry: FWHM can be applied to characteristics such as radiation patterns, spectral linewidths, etc., and the variable can be wavelength, spatial or angular properties, etc., as appropriate.

[SOURCE: IEC 60050-731:1991, 731-01-57]

### 3.6 power factor

under periodic conditions, ratio of the absolute value of the active power  $P$  to the apparent power  $S$

[SOURCE: IEC 60050-131:2002, 131-11-46, modified – The formula and note have been omitted.]

### 3.7 active power

$P$

real power

effective power

under periodic conditions, mean value, taken over one period  $T$ , of the instantaneous power  $p$ :

$$P = \frac{1}{T} \int_0^T p dt$$

Note 1 to entry: The coherent SI unit for active power is the watt (W).

[SOURCE: IEC 60050-131:2002, 131-11-42, modified – Note 1 to entry has been omitted.]

### 3.8 total harmonic distortion THD

ratio of the total r.m.s. value of the harmonics (in this context harmonic currents  $I_n$  of the order  $n$ ) of orders 2 to 40 to the r.m.s. value of the fundamental:

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$$\text{THD} = \sqrt{\sum_{n=2}^{40} \left( \frac{I_n}{I_1} \right)^2}$$

Note 1 to entry: This definition has been chosen in accordance with the relevant standard IEC 61000-2-2.

### 3.9 IP class IP rating IP code

degree of protection provided by enclosures for electrical equipment against penetration by foreign bodies and dust/water

Note 1 to entry: IP classes are defined in IEC 60529.

[SOURCE: IEC TS 62257-9-5:2018, 3.16]

### 3.10 metadata

information that relates a test result to a specific sample and provides context about the result (e.g. specific test method used)

[SOURCE: IEC TS 62257-9-5:2018, 3.21]

### 3.11 multimeter

multirange multifunction measuring instrument intended to measure voltage, current and sometimes other electrical quantities such as resistance

[SOURCE: IEC 60050-312:2001, 312-02-24]

**3.12****illuminance meter**

instrument for measuring illuminance

[SOURCE: IEC 60050-845:1987, 845-05-16]

**3.13****integrating sphere**

hollow sphere whose internal surface is a diffuse reflector, as non-selective as possible

Note 1 to entry: An integrating sphere is used to determine the total luminous flux (lumen output) of a lighting device.

Note 2 to entry: An integrating sphere is used frequently with a radiometer or photometer.

[SOURCE: IEC 60050-845:1987, 845-05-24]

**3.14****lamp**

device including a light source intended to be installed in or permanently fixed to a lampholder or luminaire

**3.15****coefficient of variation**

ratio of the standard deviation to the mean

**3.16****integrated compact fluorescent lamp**

compact fluorescent lamp that incorporates, permanently enclosed, all elements that are necessary for starting and for stable operation

**3.17****non-integrated compact fluorescent lamp**

compact fluorescent lamp that incorporates electrical contacts intended for connection to a ballast through a lampholder

Note 1 to entry: Non-integrated compact fluorescent lamps are not included in the scope of this document, but can be components of a lighting appliance that is included in the scope.

**3.18****compact fluorescent lamp****CFL**

tubular fluorescent lamp unit, having a bent tube, which does not include any replaceable or interchangeable parts

**3.19****linear fluorescent lamp**

straight tubular fluorescent lamp unit that incorporates electrical contacts intended for connection to a ballast through a lampholder, and which does not include any replaceable or interchangeable parts

**3.20****light emitting diode****LED**

solid state device embodying a p-n junction, emitting optical radiation when excited by an electric current

[SOURCE: IEC 60050-845:1987, 845-04-40]