IEC TS 62257-6

Edition 2.0 2015-12

TECHNICAL SPECIFICATION

Recommendations for renewable energy and hybrid systems for rural electrification –
Part 6: Acceptance, operation, maintenance and replacement

IEC TS 62257-6:2015-12(en)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
More than 60 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

IEC TS 62257-6

Edition 2.0 2015-12

TECHNICAL SPECIFICATION

Recommendations for renewable energy and hybrid systems for rural electrification –
Part 6: Acceptance, operation, maintenance and replacement

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 27.160

ISBN 978-2-8322-3069-5

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

RECOMMENDATIONS FOR RENEWABLE ENERGY AND HYBRID SYSTEMS FOR RURAL ELECTRIFICATION –

Part 6: Acceptance, operation, maintenance and replacement

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- 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 62257-6, which is a technical specification, has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This second edition cancels and replaces the first edition issued in 2005. It constitutes a technical revision.

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

– redefine the maximum AC voltage from 500 V to 1 000 V as well as the maximum DC voltage from 750 V to 1 500 V; and
– removal of the limitation of the 100 kVA system size. Hence the removal of the word “small” with regard to the title and related references in this document.

This technical specification is to be used in conjunction with the IEC 62257 series.

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

Enquiry draft	Report on voting
82/951/DTS	82/1002A/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 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.

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

INTRODUCTION

The IEC 62257 series intends to provide to different players involved in rural electrification projects (such as project implementers, project contractors, project supervisors, installers, etc.) documents for the setting up of renewable energy and hybrid systems with AC voltage below 1 000 V and DC voltage below 1 500 V.

These documents are recommendations:

- 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 rural electrification concentrating on, but not specific to, developing countries. They should not be considered as all inclusive to rural electrification. The documents try to promote the use of renewable energies in rural electrification; they do not deal with clean mechanisms developments at this time (CO_2 emission, carbon credit, etc.). 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 as well as sustainability of systems aiming at the lowest life cycle cost as possible. One of the main objectives is to provide the minimum sufficient requirements, relevant to the field of application, that is: renewable energy and hybrid off-grid systems.

The purpose of this technical specification is to propose a methodology to achieve the best technical and economic conditions for acceptance, operation, maintenance and replacement of equipment and complete system life cycle.

RECOMMENDATIONS FOR RENEWABLE ENERGY AND HYBRID SYSTEMS FOR RURAL ELECTRIFICATION –

Part 6: Acceptance, operation, maintenance and replacement

1 Scope

This part of IEC 62257, which is a technical specification, intends to describe the various rules to be applied for acceptance, operation, maintenance and replacement (AOMR) of decentralized rural electrification systems (DRES) which are designed to supply electric power for sites which are not connected to a large interconnected system, or a national grid, in order to meet basic needs.

The majority of these sites are:

- isolated dwellings;
- village houses;
- community services (public lighting, pumping, health centers, places of worship or cultural activities, administrative buildings, etc.);
- economic activities (workshops, micro-industry, etc.).

This technical specification proposes a methodology to achieve the best technical and economic conditions for acceptance, operation, maintenance and replacement of equipment and complete system life cycle.

It does not substitute for technical manuals provided by manufacturers for each equipment. The complexity of the system and application will dictate the level of required AOMR documentation.

2 Normative reference

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 62257 (all parts), *Recommendations for renewable energy and hybrid systems for rural electrification*

IEC TS 62257-1, *Recommendations for renewable energy and hybrid systems for rural electrification – Part 1: General introduction to IEC 62257 series and rural electrification*

IEC TS 62257-2, *Recommendations for renewable energy and hybrid systems for rural electrification – Part 2: From requirements to a range of electrification systems*

IEC TS 62257-3, *Recommendations for renewable energy and hybrid systems for rural electrification – Part 3: Project development and management*

IEC TS 62257-4, *Recommendations for renewable energy and hybrid systems for rural electrification – Part 4: System selection and design*

IEC TS 62257-7, *Recommendations for renewable energy and hybrid systems for rural electrification – Part 7: Generators*

IEC TS 62257-8, *Recommendations for renewable energy and hybrid systems for rural electrification – Part 8: Batteries and converters*

IEC TS 62257-9 (all parts), *Recommendations for renewable energy and hybrid systems for rural electrification – Part 9-XX: Integrated systems*

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*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
AOMR actions
acceptance, operation, maintenance and replacement actions
key processes that are required for the overall successful implementation of an isolated electrification system

3.2
implementation contract
contract between project developer and project implementer usually the result of a competitive sollicitation for proposals developed by the project developer on the basis of the general specification

3.3
electric equipment
item used for such puposes as generation, conversion, transmission, distribution or utilization of electric energy, such as electric machines, transformers, switchgear and controlgear, measuring instruments, protective devices, wiring systems, current-using equipment

[SOURCE: IEC 60050-826:2004, 826-16-01]

3.4
REN
renewable energy
energy from a source that is not depleted when used

[SOURCE: IEC TS 62257-2:2015, 3.1]

4 General aspects

4.1 Introduction to AOMR actions

Isolated electrification systems are designed to supply power to those individuals, communities or loads located in remote areas not connected to national grids.

These systems can be broken down into three categories:

- process electrification systems (for instance for pumping);
- individual electrification systems (IES) (single user, load or application);

- collective electrification systems (CES) (multiple user load or application).

In order to satisfy the various energy requirements both in terms of quality and quantity, six types of isolated micropower systems have been identified (see IEC 62257-2).

AOMR actions are introduced in Table 1.

A basic system acceptance process description is given in Table 2.

Table 1 – AOMR actions

Acceptance	• checking the process to ensure that the system installation meets the requirement set forth in the implementation contract between the project developer and the project implementer • testing the process to ensure that the micropower system operates according to the functional part of the implementation contract • once the parties have come to agreement, transfer the responsibility of the system
Operation	• managing the business of system operation • monitoring "normal" system operation ("normal" operation = system supplies the power complying with all the characteristics of the expected service, with the original designed configuration) • managing system electrical operation = executing actions on electrical circuits (configuration changes) • response to abnormal operating conditions = to provide service outside of the boundaries of the implementation contract (prolonged absence of REN sources) • response to abnormal system operation corrective actions (manual or automatic), troubleshooting and repair system or system components (diagnosing the cause(s) for failure); fault finding = to service the plant and restore its operating conditions following an unpredictable failure • guaranteeing safety while performing (servicing) actions on the plant • performing analysis and retrofit of the system to account for new operating conditions
Maintenance	• preventive maintenance: keeping and maintaining the system to its «normal» operating state • corrective maintenance: adjusting, fixing or replacing components after fault recognition • conducting periodic tests and inspection
Replacement	• replacing the equipment on «normal» life cycle completion • replacing the equipment for upgrading purposes • dismantling and recycling at end of life cycle

Table 2 – System acceptance process description

Acceptance process		Objective	Responsible party	Implementers	Content of a suggested data sheet
Phase 1	Preparation	To collect all information on the system	Project implementer	Project implementer/ subcontractor	List of contractual documents to be provided
Phase 2	Check of existing documentation, contract clauses	To check that all non operational contractual requirements are met: Documentation, manuals, spare parts, drawings, procedures, warranty contracts, etc.	Project developer	Consultant engineer	List of contractual documents to be provided
Phase 3	Commissioning step 1: Evaluation of the conformity of the installed system with the accepted design	To check that the equipment complies with the contractual accepted design and that any differences are explained	Project developer	Consultant engineer	Equipment list: Initial design list/as built list/comments
	Commissioning step 2: Evaluation of qualification of the installation	To check that the system is ready to be operated	Project implementer	Project implementer/ subcontractor	Letter
	Commissioning step 3: Preliminary tests	To test that the system components operate correctly	Project developer	Consultant engineer	Component by component, verification: Proper type and reference according to the as built list Proper installation: check list of key points Proper operation: list of tests with targeted performances to be obtained
	Commissioning step 4: Performance testing	To check all the operating performances of the whole system	Project developer	Consultant engineer	List of system tests with targeted performances to be obtained
Phase 4	Agreement	Transfer of responsibility	Project implementer/ developer/ operator/ owner		Letter of acceptance