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Priporočila za sisteme malih obnovljivih virov energije in hibridne sisteme za elektrifikacijo podeželja - 9-4. del: Integrirani sistem - Uporabniška inštalacija

Recommendations for small renewable energy and hybrid systems for rural electrification - Part 9-4: Integrated system - Userinstallation

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Recommendations for small renewable energy and hybrid systems for rural electrification –

Part 9-4: Integrated system – User installation

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 9-4: Integrated system – User installation

FOREWORD

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- 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 62257-9-4, which is a technical specification, has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This part of IEC 62257-9 is based on IEC/PAS 62111 (1999); it cancels and replaces the relevant parts of IEC/PAS 62111.

This part of IEC 62257-9 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
82/414/DTS	82/441/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 of the IEC 62257 series, under the general title *Recommendations for small renewable energy and hybrid systems for rural electrification*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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.

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 a.c. nominal voltage below 500 V, d.c. nominal voltage below 750 V and nominal power below 100 kVA.

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, sustainability of systems and 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: small renewable energy and hybrid off-grid systems.

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

Part 9-4: Integrated system – User installation

1 Scope

The purpose of this part of IEC 62257 is to specify the general requirements for the design and the implementation of a user's installation.

This part of IEC 62257-9 applies to single phase user's electrical installations with maximum power of 500 VA, in Decentralized Rural Electrification Systems (DRES).

NOTE For installations above 500 VA in decentralized electrification systems, IEC 62257-5 applies.

This part of IEC 62257-9 is applicable to installations supplied by a microgrid (120 V a.c. or 230 V a.c.) and to installations encompassing their own single-unit micropowerplant (120 V a.c. or 230 V a.c. or 12 V d.c. or 24 V d.c.)

The part of IEC 62257-9 applies neither to the electric power production and distribution installations described in the sections concerning microplants and microgrids, nor to user electrical equipment. It details the rules governing the design and construction of consumer's electrical installations for the purpose of ensuring the safety of persons and property, and satisfactory operation in accordance with the purpose for which the installations are designed.

It applies to new installations and modifications of existing installations.

2 Normative reference

The following referenced documents are essential 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 60269 (all parts), *Low-voltage fuses*

IEC 60364-5-52, *Electrical installations of buildings – Part 5-52: Selection and erection of electrical equipment – Wiring systems*

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

3 Terms and definitions

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

3.1
protective conductor
(identification: PE)
conductor provided for purposes of safety, for example protection against electric shock

NOTE In an electrical installation, the conductor identified PE is normally also considered as protective earthing conductor.

[IEV 195-02-09]

3.2
PEN conductor
conductor combining the functions of a protective earthing conductor and a neutral conductor

[IEV 195-02-12]

3.3
equipotential bonding
provision of electric connections between conductive parts, intended to achieve equipotentiality

NOTE The role of the equipotential bonding is to decrease the difference in potential that can exists between two exposed-conductive parts of an installation.

3.4
surge arrester
device designed to protect the electrical apparatus from high transient overvoltages and to limit the duration and frequently, the amplitude of the follow-on current

3.5
supply point
contractual limit between the grid and the user's installation

NOTE In rural electrification systems, it is generally located on the input terminals (microgrid side) of the user's interface.

3.6
Surge Protective Device
SPD
device that is intended to protect the electrical apparatus from transient overvoltages and divert surge current; it contains at least one non linear component

4 General considerations

4.1 General

User installations shall be designed to ensure protection of persons, animal and equipment in compliance with IEC 62257- 5.

Specific requirements for generators associated with stand-alone user installations are provided in the relevant part of the IEC 62257-7 series.

4.2 Installation limits

Installation limits are illustrated in following Figure 1.

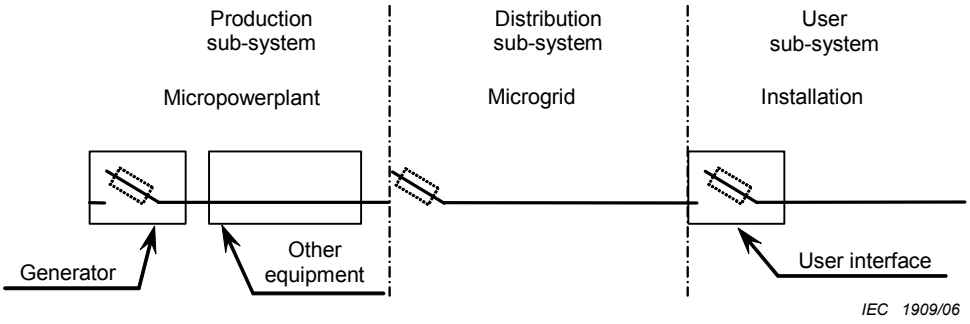

Figure 1 – Installation limits

4.3 User interface

See IEC 62257-9-3.

5 Protection against electric shock

5.1 Requirements for d.c. parts of installation

Simple separation, at least, shall be provided between the d.c. side and the a.c. side of a stand-alone installation (for a PV array, see also IEC 62257-7-1).

5.2 Requirements for a.c. parts of installation

5.2.1 General

The characteristics of the protective devices shall be such that if a fault of negligible impedance occurs anywhere in the installation between a phase conductor and a protective conductor or exposed conductive part, automatic disconnection of the supply will occur within 0,4 s.

A residual current protective device, with a rated operating residual current not exceeding 30 mA shall be provided as additional protection for each installation. It shall be placed in the user's interface housing.

5.2.2 Neutral earthing system

5.2.2.1 Installation supplied from a microgrid or standalone installation encompassing a micropowerplant 230 V or 120 V a.c.

User's electrical installation should be preferably designed according to a TN-S system.

NOTE 1 The TT system is not recommended for the user's installation, because for the TT system, each house is equipped with an earth electrode. For the electrification of remote villages, it could be difficult to install and maintain an effective earth electrode in each house.

Figure 2 illustrates the fault current circulation in TN-C-S systems.

NOTE 2 The "grey box" called "user interface" is specified in IEC 62257-9-3.

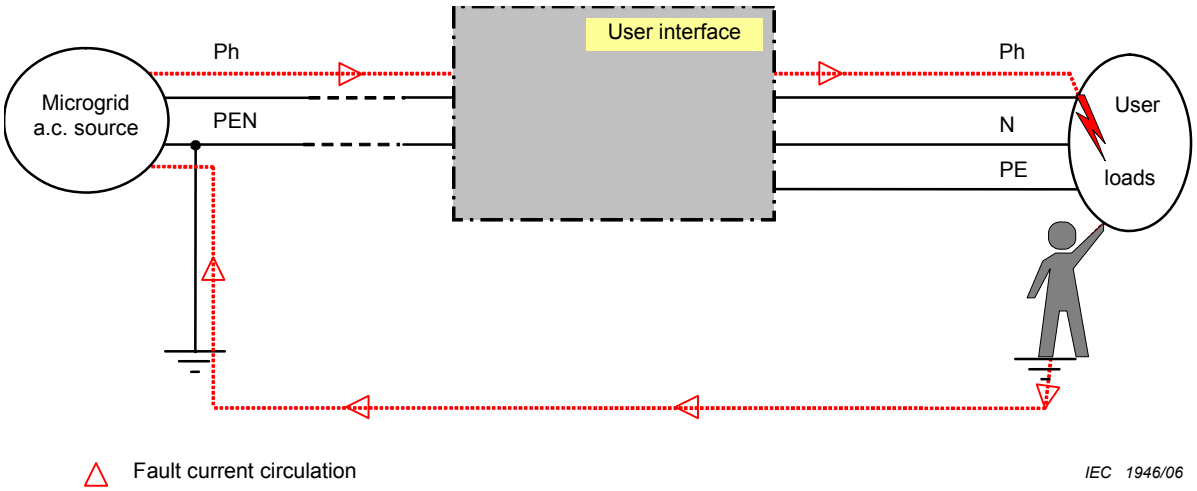

Figure 2 – Protection of persons in an installation supplied from a microgrid according to a TN-C-S system

5.2.2.2 Standalone installation with a.c. and d.c. electrical circuits, encompassing d.c. micropowerplant (ex: PV generators)

IEC 62257-5 provides provisions to apply on d.c. and a.c. circuits.

For combined systems in which a part of the installation is 12 V / 24 V d.c. and the other part is 120 V or 230 V a.c., through a d.c./a.c. converter, a TN-S system shall be created for the a.c. part. The PE conductor shall be earthed.

Figure 3 shows the fault current circulation and the principles for protection of persons in a combined d.c. and a.c. system.

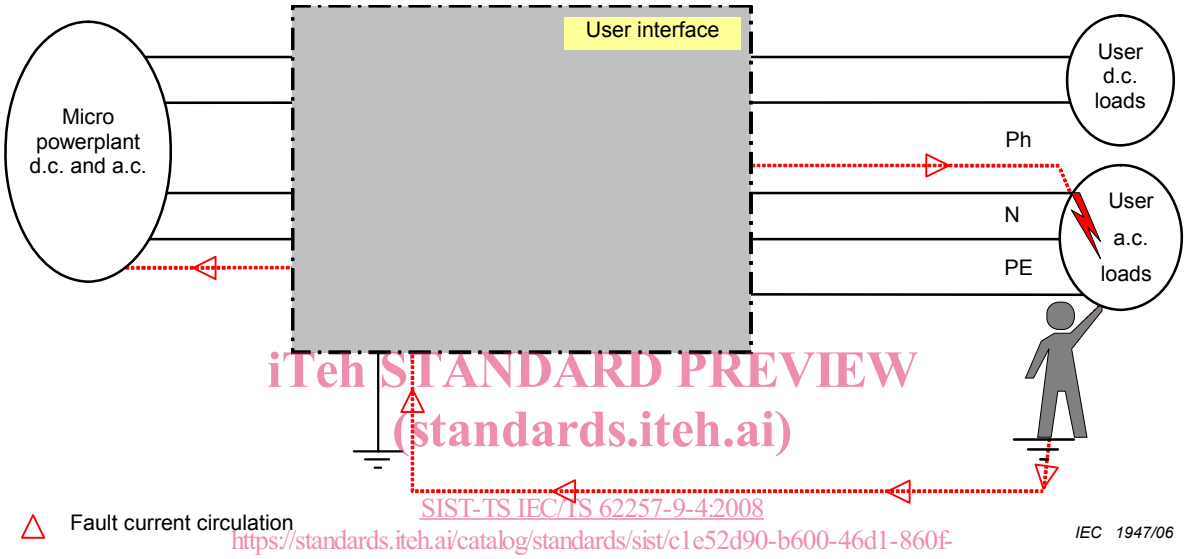

Figure 3 – Protection of persons in a combined d.c. and a.c. system

6 Protection against overcurrent

The installation may consist of one single circuit or be divided in several sub-circuits. Each circuit shall be protected against overcurrent. Where the installation comprises only one circuit, the overcurrent protective device is located in the user's interface housing.

NOTE 1 if the sub-circuits have the same cross sectional area as the main supply circuit (see 8.1.3), protection may be provided by a single device on the main supply circuit.

Table 1 shows the maximum design current of the circuits in a 500 VA installation.

Table 1 – maximum design current of circuits depending on voltages

Voltage	Maximum design current
120 V a.c.	5 A
230 V a.c.	2 A
12 V/ 24 V d.c.	40 A / 20 A

NOTE 2 Protection against fire is also performed by RCD's defined in 5.2.1. for a.c. circuits.