TECHNICAL SPECIFICATION **IEC TS 62257-9-3**

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2006-10

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

Part 9-3: Integrated system – User interface

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International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

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

Part 9-3: Integrated system – User interface

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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 62257-9-3, 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
82/413/DTS	82/440/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- withdrawn;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 9-3: Integrated system – User interface

1 Scope

The purpose of this part of IEC 62257 is to specify the general requirements for the design and the implementation of the interface equipment within the user's installation which connects to a microgrid or the generating part of a standalone system.

This interface is a part of the user's installation as shown in Figure 1.

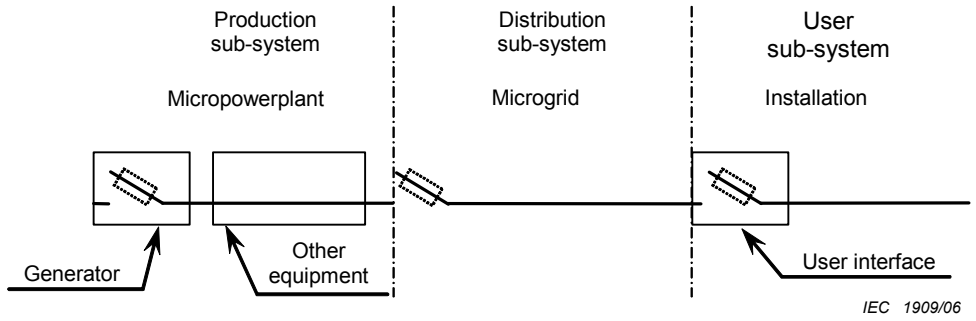


Figure 1 – General configuration of an electrification system

This part of IEC 62257-9 applies to a simplified user's interfaces (distribution board) in 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 applies to an interface equipment within the user's installation and which connects the user's installation to:

- 230 V a.c. or 120 V a.c. microgrid,
- the generating part – a.c. or d.c. - of a stand-alone installation.

This equipment provides protection, isolation, and distribution functions.

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 60364 (all parts), *Electrical installations of buildings*

IEC 60439-3:1990, *Low-voltage switchgear and control gear assemblies – Part 3: Particular requirements for low-voltage switchgear and control gear assemblies intended to be installed in places where unskilled persons have access for their use – Distribution boards*
Amendment 1:1993
Amendment 2:2001

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
carrier (messenger)
wire or rope, the primary function of which is to support the cable in aerial installations, which may be separate from or integral with the cable it supports

3.2
block
part of a line between two consecutive stoppage poles

3.3
earth
conductive mass of the earth, whose electric potential at any point is conventionally taken as equal to zero

3.4
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.

3.5
microgrid
subsystem of a DRES intended for power distribution of which the capacity does not exceed 100 kVA

NOTE The prefix «micro» is intended to express the low level of transmitting capacity.

3.6
micropowerplant
subsystem of a DRES for power generation up to 100 kVA

NOTE The prefix «micro» is intended to express the low power level generated (from a few kVA to a few tens of kVA).

3.7
protective conductor
(identification: PE)
conductor provided for purposes of safety, for example protection against electric shock

[IEV 195-02-09]

3.8
PEN conductor
conductor combining the functions of a protective earthing conductor and a neutral conductor

[IEV 195-02-12]

3.9
power line
overhead or underground line installed to convey electrical energy for any purpose other than communication

3.10
section of an overhead line
part of a line between two tension poles

NOTE A section generally includes several spans.

3.11
selectivity (or protection coordination)
the ability of a protection to identify the faulty section and/or phase(s) of a power system

[IEV 448-11-06]

3.12
service connection line
conductors between the supplier's mains and the customer's installation. In the case of an overhead service connection, this means the conductor between a supply-line pole and the customer's installation

3.13
span
part of a line between two consecutive poles

3.14
stay
steel wire, rope or rod, working under tension, that connects a point of a support to a separate anchor

3.15
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.

3.16
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

3.17
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 Electrical characteristics

4.1 Equipment

The user interface is a type-tested assembly which satisfies the requirements of IEC 60439-3.

The user interface can be either a manufactured product or assembled on site according to the manufacturer's instructions.

4.2 System voltages

The user interface can be used for user's installations supplied from:

- a microgrid or a stand-alone generator supplying 230 V a.c. or 120 V a.c.,
- a d.c. generator (for example, a photovoltaic installation) supplying 12 V or 24 V d.c.,
- an a.c. generator supplying 230 V a.c. or 120 V a.c.

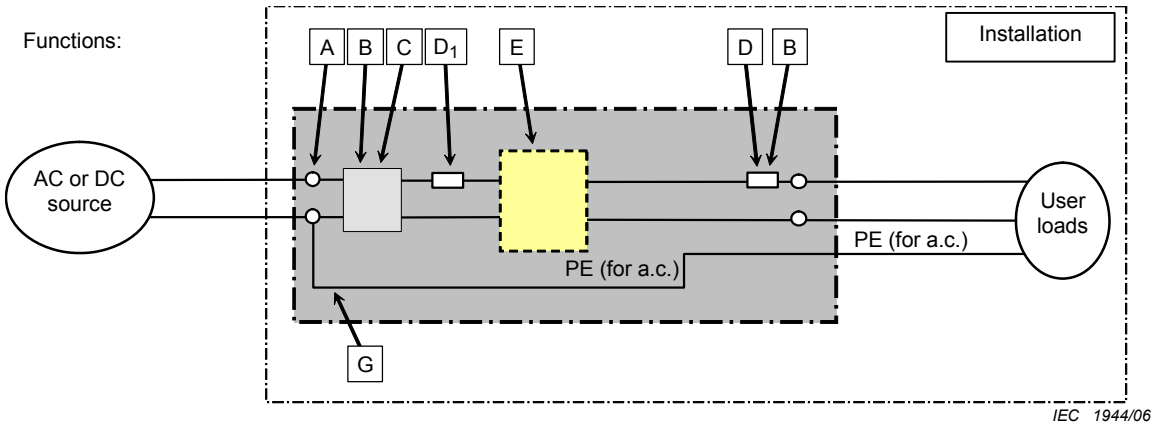
5 Functional description

The functions to be ensured by the user interface in accordance with the IEC 62257-9-4 are listed in Table 1.

Table 1 – Functions ensured by various types of user interfaces

Function	Description
A	Connection to electricity sources (microgrid or generator)
B	Isolation from the electricity sources
C	Protection against electric shocks
D, D1	Protection against overloads and short-circuits
E	Contract management if relevant
F	Earthing terminal
G	Distribution of circuits

Figure 2 and Figure 3 are examples of installation and functions ensured by the user interface. (Technical functions represented are not contractually binding).



NOTE Function D1 can be ensured by the unit ensuring functions A, B and C, or by a special unit, or by the unit ensuring function E.

Figure 2 – Interface for user installations supplied from an a.c. or a d.c. source

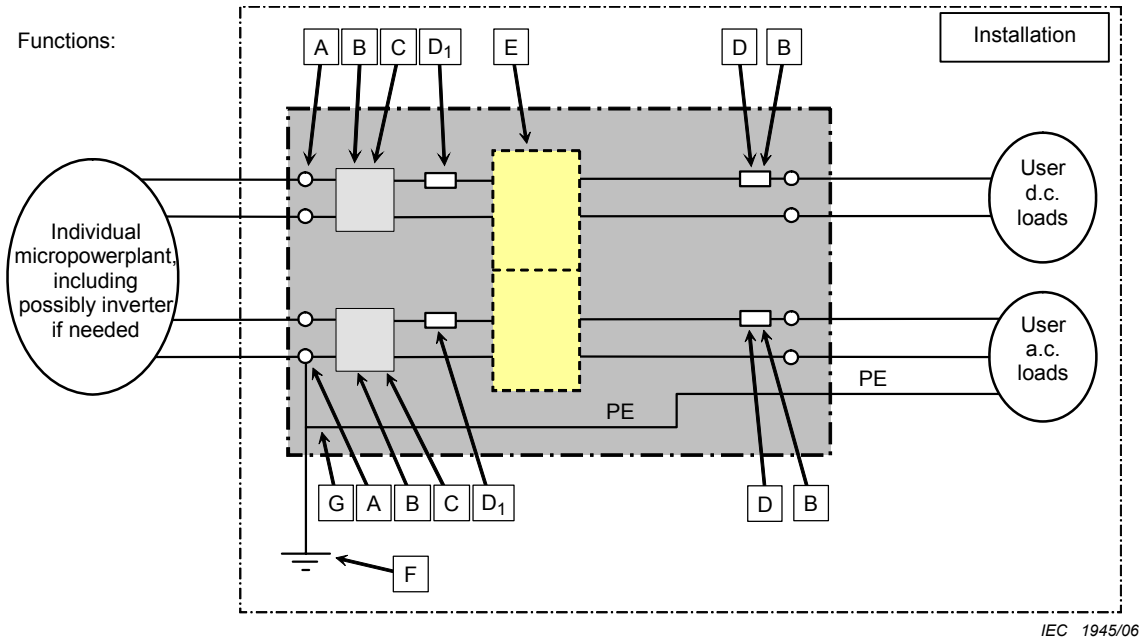


Figure 3 – Interface for user installations supplied locally from a.c. or d.c. sources (not from a microgrid)

6 Design and erection

6.1 System earthing

In accordance with IEC 62257-5, IEC 62257-9-2 and IEC 62257-9-4, only TN-S user installations are considered in this part of IEC 62257-9.

6.2 Implementation of interface functions

6.2.1 Function A: connection to electricity sources

Function A is a connection point between the microgrid (or micropowerplant) and the user's installation. It comprises terminals able to accept:

- Installation connected to a microgrid (Figure 2)
  - The terminal shall be able to connect cables up to 6 mm².
- Installation connected to a micropowerplant (Figure 3)
  - For a.c.: the terminal shall be able to connect cables up to 6 mm²,
  - For d.c.: the terminal shall be able to connect cables up to 10 mm².

6.2.2 Function B: isolation

This function is to electrically isolate the user's installation from the microgrid or from the micropowerplant.

NOTE Function B can be incorporated in the devices dedicated to functions C or D.

6.2.3 Function C: protection against direct and indirect contact

A Residual Current protective Device with a rated operating residual current less than or equal to 30 mA shall be used.

NOTE It can be combined with the device dedicated to Function D (see IEC 61009 series).

6.2.4 Function D: protection against overcurrents

Protection of property against short-circuits and overloads in the user's installation shall be performed by one or several magnetic-thermal circuit breakers or by one or several fuse(s)as specified in IEC 62257-9-4.

6.2.5 Function E: contract management

The aim of the function is to ensure that the contractual arrangement with the operator is fulfilled. For example, electricity meter, power limiter, power and energy limiter etc. .

6.2.6 Function F: earthing

This function is to provide a connection point for earthing conductor. The connection terminals should allow for connection of cables according to IEC 62257-9-4.

The same terminal may be used for connection of the earthing conductor, the PE and the neutral conductor, provided it has been designed for.

6.2.7 Function G: distribution of circuits

This function is to allow the connection of several circuits of the user’s installation, including overcurrent protective devices.

It should allow for the connection of cables up to 6 mm² in accordance with the technical specification governing « user’s installations » (see IEC 62257-9-4).

6.3 Insulation requirements

Internal assembly and connections shall be performed such that clearances and creepage distances between the live parts (accessible or not) and the chassis/ground are never less than 3 mm.

The integrity of the insulation shall be checked by measurements in reference to IEC 60439-3.

6.4 Selection of electrical equipment

The components shall comply with the applicable standards by which they are concerned whenever such standards exist.

6.5 Housing

All the equipment for the user’s interface whose functions are described in clause 6.2. shall be in one container, including the interfaces for the set of cables connecting the electrical power source and the user's circuits.

The housing shall not be in contact with the active parts of the equipment which it contains; the housing shall satisfy the requirements of protection index IP54 and IK4 for mechanic impact.

The protection index of the housing shall not be affected by the mounting system or by penetration of the cables. The housings shall be equipped with pre-shaped inputs equipped with fittings for passage of the cables.

6.6 Protection against fraudulent use

The interfaces shall be sealable by the local power distribution operator by means of approved seal fitting pliers. The seal shall prevent the user's from accessing the power connection terminals and the protective conductor terminals. If necessary, on operator request, access will be prohibited to the front panels of the function blocks.

The housing shall be designed such that the seals can be easily installed.

7 Information to be given and marking

Information and marking shall be provided according to IEC 60439-3. The information may be given on a nameplate or by other means provided that it is legible and durable.

The assembly shall carry at least the following information and marking:

- manufacturer’s trademark,
- type reference,
- identification of neutral circuit (by N or light-blue color code),

In stand-alone installations, for combined individual electrification systems producing both d.c. and a.c. power from a d.c. generator, the markings shall clearly identify the types of circuits with no possible ambiguity. The following shall be identified:

- d.c. circuit and poles,
- a.c. circuit (Ph / N / PE),
- earthing circuit.

Where equipment has compliance marking or monograms indicating compliance with standards or with distinctive manufacturer’s number serving as manufacturer’s trademark, these monogram/marking shall remain visible even after the conductors have been connected.

The markings and indications shall be long-lasting and easily readable.

8 Verification and acceptance

8.1 General

The verification and commissioning shall be carried out by a qualified technician.

The simplified user's interface diagrams shall be provided to the technician in charge of the verification procedure.

The safety rules shall be observed during the verification and commissioning procedure to avoid any danger to persons, animals and property.

When performing extensions or modifications to the user’s installations, the necessary measures shall be taken to verify that the modifications satisfy the specifications of the simplified user's interface and do not compromise the safety or service life of the existing installation.

8.2 Verification by inspection

This verification shall be conducted prior to the commissioning.

This procedure is intended to verify that the simplified user's interface and the equipment connected to it comply with the applicable specifications. These requirements can be verified by examination of the markings or compliance certificate.

The inspection procedure shall verify, at least the following conditions to the extent that they apply:

- appropriateness of the protection against electrical shocks and overcurrents,
- identification of various circuits and conductors,
- identification of equipment and terminals,
- appropriateness of conductor cross sectional area and connections,
- accessibility for verification and maintenance,
- correct operation of the contract management device.

8.3 Commissioning tests

With the equipment powered up, these tests shall consist in verifying the compatibility of all the components of the simplified user's interface and operation of all the devices, as well as the contract or energy manager operating points.

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