PD IEC/TS 62257-9-3:2016

BSI Standards Publication

Recommendations for renewable energy and hybrid systems for rural electrification

Part 9-3: Integrated systems
— User interface

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National foreword

This Published Document is the UK implementation of IEC/TS 62257-9-3:2016. It supersedes DD IEC/TS 62257-9-3:2006 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GEL/82, Photovoltaic Energy Systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Recommendations for renewable energy and hybrid systems for rural electrification –
Part 9-3: Integrated systems – User interface

INTERNATIONAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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RECOMMENDATIONS FOR RENEWABLE ENERGY AND HYBRID SYSTEMS FOR RURAL ELECTRIFICATION –

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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 62257-9-3, 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 2006. It constitutes a technical revision.

The main technical changes with regard to the previous edition are as follows:

- Changing the voltage range covered by the technical specification to a.c. nominal voltage below 1 000 V and d.c. nominal voltage below 1 500 V (introduction).
- Deleted below 100 kVA from upper limit.
- Including 240 V and 220 V 1-Ø in the voltage levels (scope).
- Deleted the terms microgrid and micropowerplants from terms and definitions.
- Stated the requirement for segregation between a.c. and d.c circuits in housing (6.5).
- Stated that the protection devices for overcurrent are always accessible (6.6).

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

Enquiry draft	Report on voting
82/1030/DTS	82/1089/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 part of IEC 62257-9 is to be used in conjunction with the IEC 62257 series.

This document 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.

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

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 1 000 V and d.c. nominal 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, 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 RENEWABLE ENERGY AND HYBRID SYSTEMS FOR RURAL ELECTRIFICATION –

Part 9-3: Integrated systems – User interface

1 Scope

This part of IEC 62257, which is a technical specification, specifies 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.

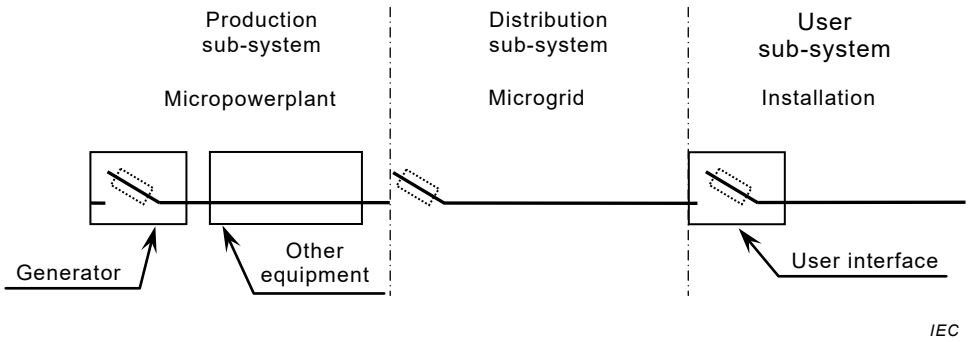


Figure 1 – General configuration of an electrification system

This part of IEC 62257 applies to simplified user's interfaces (distribution board) in electrical installations with maximum power of 500 VA in Decentralized Rural Electrification Systems (DRESs).

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

This part of IEC 62257 applies to an interface equipment within the user's installation and which connects the user's installation to:

- 240 V or 230 V or 220 V or 120 V a.c. microgrid,
- the generating part – a.c. or d.c. – of a standalone installation.

This equipment provides protection, isolation, and distribution functions.

2 Normative reference

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 61439-3, *Low-voltage switchgear and controlgear assemblies – Part 3: Distribution boards intended to be operated by ordinary persons (DBO)*

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

IEC TS 62257-5, *Recommendations for renewable energy and hybrid systems for rural electrification – Part 5: Protection against electrical hazards*

IEC TS 62257-9-2, *Recommendations for renewable energy and hybrid systems for rural electrification – Part 9-2: Integrated systems – Microgrids*

IEC TS 62257-9-4, *Recommendations for renewable energy and hybrid systems for rural electrification – Part 9-4: Integrated systems – User installation*

3 Terms and definitions

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

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
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 1 to entry: The role of the equipotential bonding is to decrease the difference in potential that can exist between two exposed-conductive parts of an installation.

3.5
protective conductor
identification: PE
conductor provided for purposes of safety, for example protection against electric shock

[SOURCE: IEC 60050-195:1998, 195-02-09]

3.6
PEN conductor
conductor combining the functions of a protective earthing conductor and a neutral conductor

[SOURCE: IEC 60050-195:1998, 195-02-12]

3.7
power line
overhead or underground line installed to convey electrical energy for any purpose other than communication

3.8
section <of an overhead line>
part of a line between two tension poles

Note 1 to entry: A section generally includes several spans.

3.9
selectivity
protection coordination
the ability of a protection to identify the faulty section and/or phase(s) of a power system

[SOURCE: IEC 60050-448:1995, 448-11-06]

3.10
service connection line
conductors between the supplier's mains and the customer's installation

Note 1 to entry: In the case of an overhead service connection, this means the conductor between a supply-line pole and the customer's installation.

3.11
span
part of a line between two consecutive poles

3.12
stay
steel wire, rope or rod, working under tension, that connects a point of a support to a separate anchor

3.13
supply point
contractual limit between the grid and the user's installation

Note 1 to entry: In rural electrification systems, it is generally located on the input terminals (microgrid side) of the user's interface.

3.14
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

3.15
Surge Protective Device
SPD
device 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 recommended to be a type-tested assembly which satisfies the requirements of IEC 61439-3.

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:

- an a.c. microgrid or an a.c. stand-alone generator supplying 240 V or 230 V or 220 V or 120 V,
- a d.c. generator (for example, a photovoltaic installation) supplying 12 V or 24 V,
- an a.c. generator supplying 240 V or 230 V or 220 V or 120 V.

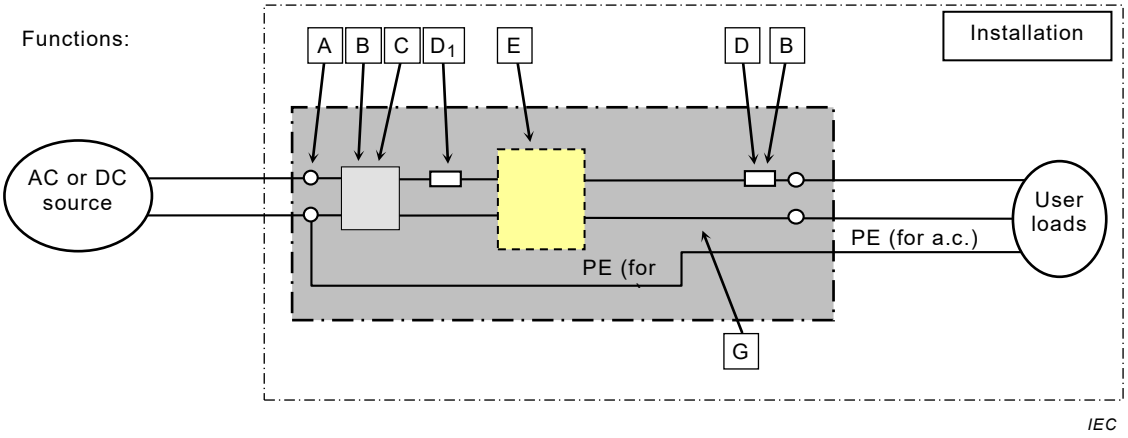
5 Functional description

The functions to be ensured by the user interface in accordance with the IEC TS 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 D_1 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

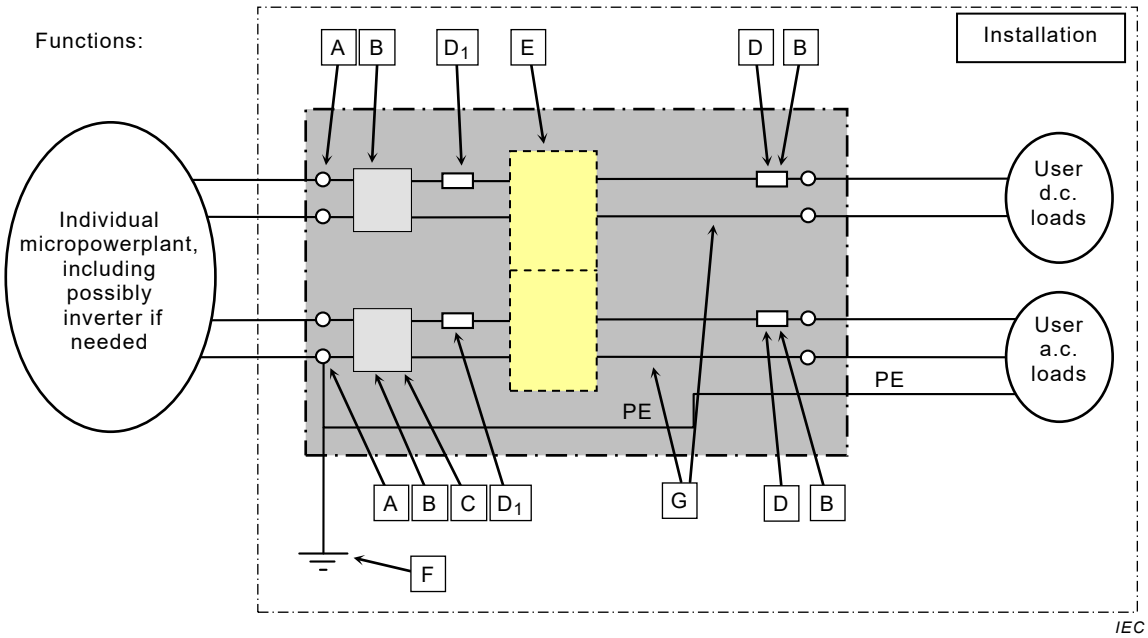


Figure 3 – Interface for user installations supplied locally from a.c. or d.c. sources (not from a microgrid)

6 Design and erection

6.1 System earthing

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

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

6.2.2 Function B: isolation

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

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 should be used (a.c).

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 TS 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 TS 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 mm^2 in accordance with the technical specification governing user’s installations (see IEC TS 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 61439-3.

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 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. Segregation shall be provided between d.c. and a.c. 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 and the protection devices for overcurrent are always accessible.

7 Information to be given and marking

Information and marking shall be provided according to IEC 61439-3. 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 standalone 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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BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

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