

SLOVENSKI STANDARD

SIST-TS IEC/TS 62257-7-3:2008

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Priporočila za sisteme malih obnovljivih virov energije in hibridne sisteme za elektrifikacijo podeželja - 7-3. del: Generatorski sklopi - Izbira generatorskih sklopov za sisteme elektrifikacije podeželja

Recommendations for small renewable energy and hybrid systems for rural electrification
- Part 7-3: Generator set - Selection of generator sets for rural electrification systems

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29.160.40	Električni agregati	Generating sets

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

Part 7-3: Generator set – Selection of generator sets for rural electrification systems

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RECOMMENDATIONS FOR SMALL RENEWABLE ENERGY
AND HYBRID SYSTEMS FOR RURAL ELECTRIFICATION –****Part 7-3: Generator set –
Selection of generator sets for rural electrification systems**

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 62257-7-3, which is a technical specification, has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This document is based on IEC/PAS 62111; it cancels and replaces the relevant parts of IEC/PAS 62111.

This technical specification is to be used in conjunction with the future parts of this series as and when they are published.

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

Enquiry draft	Report on voting
82/493/DTS	82/508/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 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 of documents 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. voltage below 500 V, d.c. voltage below 750 V and 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 must 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 development mechanisms at this time (CO₂ 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 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.

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

Part 7-3: Generator set – Selection of generator sets for rural electrification systems

1 Scope

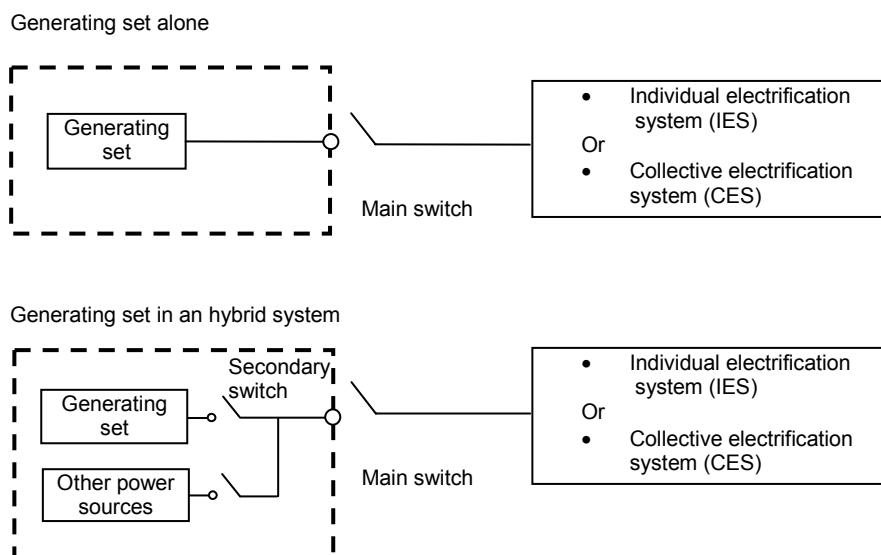
The purpose of this part of IEC 62257 is to specify the general requirements for the selection, sizing, erection and operation of generator sets in decentralized rural electrification systems.

It applies to all low voltage combustion engine electricity generator sets with a rated power up to 100 kVA, and designed for supplying electrical power to isolated sites used in systems as described in IEC/TS 62257-2.

This technical specification is not an exhaustive resource for the design, installation, operation or maintenance of generator sets but is more focused on recommendations to provide strategies on selection and criteria which may affect the use of such generation systems in a rural electrification project.

Two cases will be considered as illustrated by Figure 1 to power a collective electrification system (microgrid) or an individual electrification system.

- the micropowersystem is composed of one generator set
- the micropowersystem is a hybrid one and the generator set is only part of it. This case is addressed in the document dedicated to micropower system (IEC/TS 62257-9-1).



IEC 444/08

Figure 1 – General functional configuration of a generator set powered system

The aim of this technical specification is to provide users with the appropriate levels of reliability and safety of the equipment during its estimated service lifespan.

It describes the minimum safety requirements and does not claim to be an exhaustive instruction manual or design specification.

Compliance with this technical specification does not exempt any person, organization or corporation from the responsibility to comply with all other relevant regulations.

This technical specification gives recommendations for the following types of generator sets:

- a) single phase;
- b) three phase;
- c) LV range up to 500 V - 50/60 Hz (see IEC/TS 62257-9-2).

2 Normative references

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 60034-1, *Rotating electrical machines – Part 1: Rating and performance*

IEC 60034-9, *Rotating electrical machines – Part 9: Noise limits*

IEC 60034-22, *Rotating electrical machines – Part 22: AC generators for reciprocating internal combustion (RIC) engine driven generating sets*

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

IEC 61009-1, *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 1: General rules*

IEC/TS 62257-2:2004, *Recommendations for small renewable energy and hybrid systems for rural electrification – Part 2: From requirements to a range of electrification systems*

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

IEC/TS 62257-6, *Recommendations for small renewable energy and hybrid systems for rural electrification – Part 6: Acceptance, operation, maintenance and replacement*

IEC/TS 62257-9-1¹, *Recommendations for small renewable energy and hybrid systems for rural electrification – Part 9-1: Micropower systems*

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

ISO 8528-1:2005, *Reciprocating internal combustion engine driven alternating current generating sets – Part 1: Application, ratings and performance*

ISO 8528-3:2005, *Reciprocating internal combustion engine driven alternating current generating sets – Part 3: Alternating current generators for generating sets*

¹ To be published.

ISO 8528-5, *Reciprocating internal combustion engine driven alternating current generating sets – Part 5: Generating sets*

ISO 8528-7:1994, *Reciprocating internal combustion engine driven alternating current generating sets – Part 7: Technical declarations for specification and design*

3 Terms and definitions

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

3.1 environmental conditions

environment characteristics (altitude, temperature, humidity, etc.) which may affect the performance

3.2 generator set

equipment producing electricity from a fossil fuel; it consists basically of an internal combustion engine producing mechanical energy and a generator which converts the mechanical energy into electrical energy and mechanical transmission, support and assembly components

3.3 identification file IF

document provided by the manufacturer which guarantees the conformity of the equipment supplied with that which has undergone the type tests

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3.4 lifespan

effective period of functioning taking into account the probability of a catastrophic failure

3.5 non-routine maintenance

maintenance necessary in addition to that pre-planned

3.6 rated frequency

frequency at which the generator set is designed to operate

3.7 routine maintenance

preventive maintenance carried out to an established plan

3.8 rated electrical power (nominal power or rated capacity)

maximum continuous power supplied by a generator set in compliance with its specifications, and under standard operating conditions. This is expressed in VA (volt-ampere) or more usually in kVA

3.9 rated rotation speed

alternator rotation speed necessary to produce the voltage at the rated frequency

3.10 rated voltage

voltage between phases on the alternator terminals at the rated frequency and rated power

3.11**extra low voltage****ELV**

voltage not exceeding a limit which is generally accepted to be 50 V a.c. and 120 V d.c. ripple free

3.12**live conductive part**

conductor or conductive part intended to be energized in normal operation, including a neutral conductor, but by convention not a PE or a PEN conductor

3.13**protected extra-low voltage****PELV**

extra-low voltage system which is not electrically separated from earth, but which otherwise satisfies all the requirements for SELV

3.14**power factor**

ratio of real power to apparent power in an a.c. circuit

3.15**real power**

for a.c. circuits, the product of voltage, current and power factor, also equal to the rate of flow of electrical energy. Real power is measured in watt (W)

3.16**apparent power**

for a.c. circuits, the product of voltage by current, measured in volt-ampere (VA)

3.17**nominal power of the generator set**

maximum apparent power that can be provided by the generator set according to the manufacturer's specification

3.18**safety extra-low voltage****SELV**

extra-low voltage system which is electrically separated from earth and from other systems in such a way that a single fault cannot give rise to the risk of electric shock

3.19**minor fuel storage**

fuel storage located in the generator set room

3.20**main fuel storage**

fuel storage located outside the generator set room and able to provide fuel filling the minor fuel storage

3.21**voltage**

differences of potential normally existing between conductors and between conductors and earth as follows:

- a) Extra-low voltage: not exceeding 50 V a.c. or 120 V ripple-free d.c.
- b) Low voltage: exceeding upper limits of extra-low voltage, but not exceeding 1 000 V a.c. or 1 500 V d.c.
- c) High voltage: exceeding upper limits of low voltage

3.22**protective conductor (identification: PE)**

conductor provided for purposes of safety, for example protection against electric shock

[IEV 195-02-09]

3.23**PEN conductor**

conductor combining the functions of both a protective earthing conductor and a neutral conductor

[IEV 195-02-12]

4 Introduction to generator sets

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4.1 Generator set system

In the present document a generator set system includes the installed generator set itself, the related civil works or prefabricated enclosure if any and all relative ancillaries such as fuel tank, pipes, earthing systems, etc. necessary for the operation of the generator set.

4.2 Generator set application in rural electrification systems

The usage of generator sets in rural electrification systems application, are described in IEC/TS 62257-2 for T3, T4, T5 and T6 categories of systems.

In these system categories the generator sets are used to recharge batteries and/or provide a backup power supply to all or part of the a.c. distribution system, or to supply a.c. dedicated equipment.

The type of use of the generator set shall be clearly identified by the project developer and notified to the supplier.

4.3 Resource assessment

Before choosing a generator set as the generator in an electrification system, it is important to check the availability of the fuel supply on the installation site. It is important to check if the supply is possible all throughout the year. For example in some countries it could be impossible to deliver fuel to the site during the rainy season.

The project implementer also shall take into account that the cost of fuel may vary with the price of the oil market and also with changes in local subsidies.