SLOVENSKI STANDARD
SIST EN 61277:2001

01-september-2001

Prizemni fotonapetostni (PV) sistemi za proizvodnjo energije – Splošno in vodilo

Terrestrial photovoltaic (PV) power generating systems - General and guide

Terrestrische photovoltaische (PV) Stromerzeugungs-systeme - Allgemeines und Leitfaden

Systèmes photovoltaïques (PV) terrestres - Généralités et guide

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Ta slovenski standard je istoveten z: **EN 61277:1998**

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ICS:

27.160 Sonį na energija Solar energy engineering

SIST EN 61277:2001 **en**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61277

August 1998

ICS 27.160

English version

Terrestrial photovoltaic (PV) power generating systems General and guide (IEC 61277:1995)

Systèmes photovoltaïques (PV) terrestres
Généralités et guide
(CEI 61277:1995)

Terrestrische photovoltaische (PV) Stromerzeugungssysteme
Allgemeines und Leitfaden
(IEC 61277:1995)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Foreword

The text of the International Standard IEC 61277:1995, prepared by IEC TC 82, Solar photovoltaic energy systems, was submitted to the formal vote and was approved by CENELEC as EN 61277 on 1998-08-01 without any modification.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1999-08-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1999-08-01

Endorsement notice

The text of the International Standard IEC 61277:1995 was approved by CENELEC as a European Standard without any modification.

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SIST EN 61277:2001
https://standards.iteh.ai/catalog/standards/sist/5c5aad9c-6e16-4a26-add9-3211717f02ab/sist-en-61277-2001

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SIST EN 61277:2001

CONTENTS

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 61277:2001
https://standards.iteh.ai/catalog/standards/sist/5c5aad9c-6e16-4a26-add9-3211717f02ab/sist-en-61277-2001

SIST EN 61277:2001

INTERNATIONAL ELECTROTECHNICAL COMMISSION

TERRESTRIAL PHOTOVOLTAIC (PV) POWER GENERATING SYSTEMS – GENERAL AND GUIDE

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international cooperation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. 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. The 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 the IEC on technical matters, prepared by technical committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.

3) They have the form of recommendations for international use published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.

4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

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International Standard IEC 1277 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

Document Preview
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The text of this standard is based on the following documents:

DIS	Report on voting
82(CO)19	82(CO)39

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

Annexes A and B are for information only.

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INTRODUCTION

Photovoltaic (PV) power generating systems consist of components and sub-systems that are used to convert incident solar radiation directly into electrical energy.

The electrical parameters of the input of a sub-system should be compatible with the output electrical parameters of a preceding sub-system(s).

All sub-systems, except the PV and the electrical storage, may be referenced as a power conditioner (PC) that could be supplied as a single unit. This is indicated by the dotted line in figure 1.

Two or more functional elements may be incorporated into one physical unit. When this occurs, the input and output characteristics of the combined unit supersede any interest in the characteristics of the individual elements.

The PV power generating system may operate in parallel with some other auxiliary power source(s) that are connected at the appropriate interface(s).

In any particular PV power generating system design, some of the functional elements shown in figure 1 may be absent.

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Although the power quality parameters given for the a.c./a.c. interface and the utility interface are identical in theory and in practice, PV generated power quality should be assured at the output stage of the inverter for utility connected systems.

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For stand alone systems with a.c. load, the a.c./a.c. interface may not be necessary, depending on the a.c. load.

Since electrical and construction codes vary from one authority to another, it is necessary that specific local requirements be addressed separately. This is particularly important in electrical utility connected systems.

It should be noted that solar photovoltaic/thermal hybrid systems, auxiliary power source(s) civil engineering requirements are outside of the scope of this standard.

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TERRESTRIAL PHOTOVOLTAIC (PV) POWER GENERATING SYSTEMS – GENERAL AND GUIDE

1 Scope

This International Standard constitutes a guide and gives an overview of terrestrial PV power generating systems and the functional elements of such systems, as shown in figure 1.

Systems and the functional elements of such systems, as described in this guide, should serve as an introduction to future IEC PV system standards under consideration.

This standard contains:

- an overview of major sub-systems;
- a functional description of major components and interfaces (figure 1);
- a table with possible configurations which can be derived from the layout in figure 2.

2 Overview of possible major sub-system components and interfaces

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2.1 *Purpose*

This clause provides an overview of terrestrial PV power-producing system configurations, some of which are shown in figure 2.

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NOTE – It is intended that future IEC technical publications will provide a detailed classification of PV power generating systems.

2.2 *Major configurations*

Two major power-generating configurations are identified:

- *stand-alone system* – an independent power-producing system that is not connected to the utility;
- *utility connected system* – a power-producing system interconnected with an electric power utility.

NOTE – It is recognized that in certain countries the term "utility" is referred to as the "grid".

3 Description of major sub-systems, components and interfaces of the PV power generating system

3.1 *Purpose*

This clause provides an overview of the possible major sub-system components and interfaces which comprise a PV power generating system. Figure 1 shows a general flow diagram of such a PV system.

NOTE – It is intended that specific IEC technical publication(s) will be prepared for the system design and behaviour for each block shown in figure 1.

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3.2 *Master control and monitoring (MCM)*

3.2.1 *Functional description*

The master control and monitoring sub-system is the highest order of photovoltaic system control. It supervises the overall operation of a PV power generating system and the interaction between all sub-systems. The master control may also interact with the load(s). For ease of design and operation some or all functions of the MCM may be included in other sub-systems.

The MCM should ensure system operation in either the automatic or the manual operating mode.

The monitoring function of the MCM sub-system may include sensing and collection of data signals, processing, recording, transmission and presentation of system data as required.

This function can monitor:

- the photovoltaic array;
- d.c. conditioner;
- d.c./d.c. load interface;
- the storage sub-system;
- a.c./a.c. interface;
- load(s);
- inverter;
- auxiliary supply, etc.;
- utility interface;
- environmental conditions.

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The sub-system control function uses collected data to assure proper operation of the system.

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The sub-system control functions may include but are not limited to:

- storage control;
- array tracking;
- system start-up;
- d.c. power transmission control;
- inverter start-up and control (a.c.) load;
- other support functions.
- security;
- fire protection;
- auxiliary supply start-up and control;
- utility interface power control;
- support function(s) start-up and control;

In any particular PV power generating system design, some of the sub-systems shown could be absent and some of the components of a sub-system could be present in single or multiple form.

3.2.2 *Principal characteristics*

The MCM may be a sub-system that consists of electromechanical, electronic and/or logic circuitry or its functions may be incorporated in the other sub-systems.

NOTE – The master control may also be designed to incorporate second-level control units that may be inherent in other sub-systems.

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3.3 *PV sub-system*

3.3.1 *Functional description*

The PV sub-system consists of a mechanically and electrically integrated assembly of components required to form a unit that can produce d.c. power directly from incident solar radiation.

3.3.2 *Main components*

The PV sub-system may comprise but is not limited to:

- modules;
- sub-array;
- array field;
- electrical interconnection;
- foundation;
- mounting structure;
- protection device(s);
- grounding.

3.3.3 *Principal characteristics*

The PV sub-system should be designed on the basis of an economic and physical assessment of required system design functions and performance requirements (such as operating conditions, meteorological data, module performance, load characteristics and safety requirements).

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The PV sub-system may be designed to meet average or peak system requirements of the annual system output. Its size may be limited either by site restrictions or by the results of system optimization studies that include performance and cost.

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It should be noted that since PV sub-system orientation affects system energy reproduction, system design calculations are necessary to select the appropriate orientation for the array. Arrays can be either fixed or discretely/continuously adjustable. Optimum selection of the fixed tilt angle depends upon many factors such as location, distribution of sunlight, load profile throughout the year, and particular site conditions.

3.3.4 *Parameters*

The following should be specified:

- input conditions
  - irradiance;
  - irradiation;
- output conditions
  - power;
  - current;
  - voltage;
  - energy.