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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Solar thermal electric plants –
Part 1-5: Performance test code for solar thermal electric plants

Centrales électriques solaires thermodynamiques –
Partie 1-5: Code d'essai de performance pour centrales électriques solaires thermodynamiques

IEC 62862-1-5:2024-04(en-fr)

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FOREWORD

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The text of this International Standard is based on the following documents:

Draft	Report on voting
117/177/CDV	117/191/RVC

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 62862 series, published under the general title *Solar thermal electric plants*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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INTRODUCTION

Solar thermal power plants are electricity generation plants that use solar radiation to heat a fluid to a high temperature. This fluid usually transfers its heat to water to produce superheated steam, which is expanded in a turbine-generator machine to transform thermal energy first into mechanical energy and finally into electricity. These plants use solar collectors to concentrate the solar radiation, and they are classified depending on the concentration technology, including but not limited to parabolic-trough collector (PTC), central receiver collector (CRC) also called solar tower, and linear Fresnel collector (LFC).

Solar thermal power plants are composed of a solar field interconnected to a power block, but sometimes they also include a non-solar energy source and a thermal storage system which enable electricity generation under conditions of reduced or no solar radiation (see Figure 1). Depending on the concentration technology, the solar field can consist of a set of parabolic-trough collector rows, linear Fresnel collector rows, or a set of heliostats with a central receiver located in a tower. All these systems track the sun and collect the energy that it projects in the form of direct radiation.

The plant performance should be demonstrated, or verified, as part of the commissioning and acceptance process, for all the configurations agreed by the parties involved.

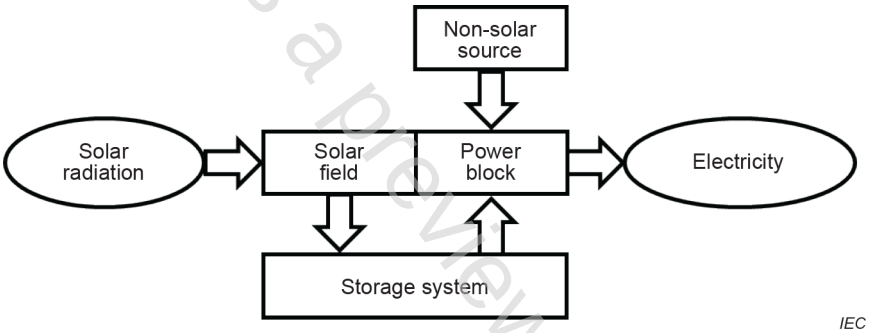

Figure 1 – Energy flows in a solar thermal power plant

The complexity and duration of performance acceptance tests depend on what these tests are for. There are several different types of tests:

- Short quasi-stationary tests: Their purpose is to verify the characteristics and features of the power plant systems (solar field, thermal storage system, power block, and auxiliary non-solar energy systems).
- Short-duration testing (at least 24 h): The purpose is to verify the performance of the power plant over a short period of time (usually associated with provisional plant acceptance testing).
- Long-duration tests (at least 365 days): The purpose is to verify or validate annual plant production and auxiliary consumptions (electricity and non-solar energy source). (These tests are usually associated with final plant acceptance.)
- Dispatchability tests: The purpose is to verify the ability of the solar thermal power plant to respond to grid operator signals regardless of meteorological conditions.
- Durability and integrity testing: The purpose is to verify integrity and validate equipment durability.

This document focuses on acceptance testing of the complete power plant and defines the measurement procedures for short-duration and long-duration efficiency testing.

SOLAR THERMAL ELECTRIC PLANTS –

Part 1-5: Performance test code for solar thermal electric plants

1 Scope

The purpose of this document is to provide procedures and guidelines to carry out acceptance tests for solar thermal power plants, of any concentration technology, with the uncertainty level given in ISO/IEC Guide 98-3.

This document establishes the measurements, instrumentation and techniques required for determining the following performance parameters for a given period:

- available solar radiation energy,
- plant electricity consumptions,
- net electricity generation,
- non-solar energy,
- net plant efficiency.

Other parameters that characterize the solar thermal power plant system features are not dealt with in this document but are the subject of other complementary standards.

This document specifies the characteristics of a calculation tool that serves as a reference for expected electricity production during the test period and under the real-time solar irradiance and other meteorological data.

This document is applicable to solar thermal power plants of any size using any concentration technology, where the sun is the main source of energy, and all elements and systems are operative. Such power plants can optionally have non-solar energy sources, such as natural gas or other renewable energies, and a thermal storage system.

This document is applicable to acceptance testing in such power plants, as well as in any other scenario in which their performance must be known. Acceptance tests serve for the purpose of verification of a contractual performance measure, and for establishing claims in case of non-fulfillment of performance. In this document the owner, builder, financier, and any other entity interested in knowing these features are called "parties involved".

2 Normative references

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 60044-7, *Instrument transformers – Part 7: Electronic voltage transformers*

IEC 60044-8, *Instrument transformers – Part 8: Electronic current transformers*

IEC TS 62862-1-1, *Solar thermal electric plants – Part 1-1: Terminology*

ISO/IEC Guide 98-3, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*