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BSI Standards Publication

# Ground-mounted photovoltaic power plants — Design guidelines and recommendations

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# National foreword

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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.

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# TECHNICAL SPECIFICATION

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## Ground-mounted photovoltaic power plants – Design guidelines and recommendations

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# GROUND-MOUNTED PHOTOVOLTAIC POWER PLANTS – DESIGN GUIDELINES AND RECOMMENDATIONS

## FOREWORD

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Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62738, which is a technical specification, has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

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

| Enquiry draft | Report on voting |
|---|---|
| 82/1291/DTS | 82/1374/RVDTS |

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 document has been drafted in accordance with the ISO/IEC Directives, Part 2.

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- withdrawn,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

This document sets out general guidelines and recommendations for the design and installation of utility scale ground-mounted photovoltaic (PV) power plants. The focus is largely on design aspects that differ from those of conventional residential and commercial PV systems. Power plants are a significant and growing component of the PV market, yet design methodologies range considerably, partly due to the fact that systems are not accessible to the public or non-qualified personnel. Overall guidelines are still needed to ensure safe, reliable, and productive systems.

# GROUND-MOUNTED PHOTOVOLTAIC POWER PLANTS – DESIGN GUIDELINES AND RECOMMENDATIONS

## 1 Scope

This document sets out general guidelines and recommendations for the design and installation of ground-mounted photovoltaic (PV) power plants. A PV power plant is defined within this document as a grid-connected, ground-mounted system comprising multiple PV arrays and interconnected directly to a utility's medium voltage or high voltage grid. Additional criteria is that PV power plants are restricted from access by non-qualified persons and are continuously monitored for safety and protection, either by on-site personnel or by active remote monitoring. Technical areas addressed are those that largely distinguish PV power plants from smaller, more conventional installations, including ground mounted array configurations, cable routing methods, cable selection, overcurrent protection strategies, equipotential bonding over large geographical areas, and equipment considerations.

Safety and design requirements are referenced to the applicable requirements of IEC 62548 to address distinct differences relative to the design requirements for residential, commercial and other non-power plant applications. In general, existing standards are referenced wherever possible for uniformity. Emphasis is placed on systems employing d.c. string based systems using large scale central inverters or 3-phase string inverters, but relevant sections are also applicable to systems employing a.c. modules or d.c./d.c. converters. Medium voltage transformers, switchgear, collection systems, substations, utility interconnection, auxiliary loads, energy storage systems, and communication services are addressed, but discussion is mostly limited to recommended references to other standards and requirements.

Rooftop-mounted systems, building integrated PV (BIPV) and building applied PV (BAPV) are not included in the scope of this document. The principles of restricted-access power plants are not compatible with systems on buildings, which are used for purposes other than power generation.

## 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 60076-1, *Power transformers – Part 1: General*

IEC 60076-2, *Power transformers – Part 2: Temperature rise for liquid-immersed transformers*

IEC 60076-3, *Power transformers – Part 3: Insulation levels, dielectric tests and external clearances in air*

IEC 60076-4, *Power transformers – Part 4: Guide to the lightning impulse and switching impulse testing – Power transformers and reactors*

IEC 60076-5, *Power transformers – Part 5: Ability to withstand short-circuit*

IEC 60076-7, *Power transformers – Part 7: Loading guide for mineral-oil-immersed power transformers*