



IEC 61400-1

Edition 4.0 2019-02

INTERNATIONAL STANDARD



**Wind energy generation systems –
Part 1: Design requirements**





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Wind energy generation systems – Part 1: Design requirements

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

WIND ENERGY GENERATION SYSTEMS –

Part 1: Design requirements

FOREWORD

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International Standard IEC 61400-1 has been prepared by IEC technical committee 88: Wind energy generation systems.

This fourth edition cancels and replaces the third edition published in 2005 and Amendment 1:2010. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) general update and clarification of references and requirements;
- b) extension of wind turbine classes to allow for tropical cyclones and high turbulence;
- c) Weibull distribution of turbulence standard deviation for normal turbulence model (NTM);
- d) updated design load cases (DLCs), in particular DLC 2.1 and 2.2;
- e) revision of partial safety factor specifications;
- f) major revision of Clauses 8, 10 and 11;

- g) introduction of cold climate requirements, Clause 14;
- h) new Annex B on design load cases for site-specific or special class S wind turbine design or site suitability assessment;
- i) new Annex J on prediction of the extreme wind speed of tropical cyclones by using Monte Carlo simulation method;
- j) new Annex K on calibration of structural material safety factors and structural design assisted by testing;
- k) new Annex L on assessment and effects of icing climate;
- l) new Annex M on medium wind turbines.

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

FDIS	Report on voting
88/696/FDIS	88/701/RVD

Full information on the voting for the approval of this International Standard 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.

A list of all parts of the IEC 61400 series, published under the general title *Wind energy generation systems*, 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 document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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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 part of IEC 61400 outlines minimum design requirements for wind turbines and is not intended for use as a complete design specification or instruction manual.

Any of the requirements of this document may be altered if it can be suitably demonstrated that the safety of the system is not compromised. This provision, however, does not apply to the classification and the associated definitions of external conditions in Clause 6. Compliance with this document does not relieve any person, organization, or corporation from the responsibility of observing other applicable regulations.

This document is not intended to give requirements for wind turbines installed offshore, in particular for the support structure. For offshore installations, reference is made to the IEC 61400-3 series.

WIND ENERGY GENERATION SYSTEMS –

Part 1: Design requirements

1 Scope

This part of IEC 61400 specifies essential design requirements to ensure the structural integrity of wind turbines. Its purpose is to provide an appropriate level of protection against damage from all hazards during the planned lifetime.

This document is concerned with all subsystems of wind turbines such as control and protection functions, internal electrical systems, mechanical systems and support structures.

This document applies to wind turbines of all sizes. For small wind turbines, IEC 61400-2 can be applied. IEC 61400-3-1 provides additional requirements to offshore wind turbine installations.

This document is intended to be used together with the appropriate IEC and ISO standards mentioned in Clause 2.

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 60034 (all parts), *Rotating electrical machines*

IEC 60038, *IEC standard voltages*

IEC 60071-1, *Insulation co-ordination – Part 1: Definitions, principles and rules*

IEC 60071-2, *Insulation co-ordination – Part 2: Application guidelines*

IEC 60076 (all parts), *Power transformers*

IEC 60204-1, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 60204-11:2000, *Safety of machinery – Electrical equipment of machines – Part 11: Requirements for HV equipment for voltages above 1 000 V AC or 1 500 V DC and not exceeding 36 kV*

IEC 60364 (all parts), *Low voltage electrical installations*

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

IEC 60664-1, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*