

Vetrne turbine – 2. del: Zahteve za načrtovanje za male vetrne turbine (IEC 61400-2:2006)

Wind turbines - Part 2: Design requirements for small wind turbines (IEC 61400-2:2006)

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English version

Wind turbines
Part 2: Design requirements for small wind turbines
(IEC 61400-2:2006)

Aérogénérateurs
Partie 2: Exigences en matière de
conception des petits aérogénérateurs
(CEI 61400-2:2006)

Windenergieanlagen
Teil 2: Sicherheit kleiner
Windenergieanlagen
(IEC 61400-2:2006)

This European Standard was approved by CENELEC on 2006-05-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

Foreword

The text of document 88/254/FDIS, future edition 2 of IEC 61400-2, prepared by IEC TC 88, Wind turbines, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61400-2 on 2006-05-01.

This European Standard supersedes EN 61400-2:1996.

The most significant changes with respect to EN 61400-2:1996 are:

- revised simplified equations based upon recent test and research results;
- several parameters in the simplified equations shall now be based upon test results;
- added option for use of aeroelastic models instead of simplified equations;
- expanded testing requirements.

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) 2007-02-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2009-05-01

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 61400-2:2006 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

ISO/IEC 17020	NOTE Harmonized as EN ISO/IEC 17020:2004 (not modified).
ISO 9001	NOTE Harmonized as EN ISO 9001:2000 (not modified).
ISO 9002	NOTE Harmonized as EN ISO 9002:1994 (not modified).
ISO 9003	NOTE Harmonized as EN ISO 9003:1994 (not modified).

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable 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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60034-1	- ¹⁾	Rotating electrical machines Part 1: Rating and performance	EN 60034-1	2004 ²⁾
IEC 60034-2	- ¹⁾	Rotating electrical machines Part 2: Methods for determining losses and efficiency of rotating electrical machinery from tests (excluding machines for traction vehicles)	EN 60034-2	1996 ²⁾
IEC 60034-5	- ¹⁾	Rotating electrical machines Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) - Classification	EN 60034-5	2001 ²⁾
IEC 60034-8	- ¹⁾	Rotating electrical machines Part 8: Terminal markings and direction of rotation	EN 60034-8	2002 ²⁾
IEC 60038 (mod) + A1 + A2	1983 1994 1997	IEC standard voltages ³⁾	HD 472 S1 + corr. February + A1	1989 2002 1995
IEC 60204-1 (mod)	- ¹⁾	Safety of machinery - Electrical equipment of machines Part 1: General requirements	EN 60204-1	2006 ²⁾
IEC 60364-5-54 (mod)	- ¹⁾	Electrical installations of buildings Part 5-54: Selection and erection of electrical equipment - Earthing arrangements, protective conductors and protective bonding conductors	HD 60364-5-54	2006 ²⁾
IEC 60721-2-1	- ¹⁾	Classification of environmental conditions Part 2-1: Environmental conditions appearing in nature - Temperature and humidity	HD 478.2.1 S1	1989 ²⁾
IEC 61400-1	- ¹⁾	Wind turbines Part 1: Design requirements	EN 61400-1	2005 ²⁾
IEC 61400-12-1	- ¹⁾	Wind turbines Part 12-1: Power performance measurements of electricity producing wind turbines	EN 61400-12-1	2006 ²⁾

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

³⁾ The title of HD 472 S1 is: Nominal voltages for low voltage public electricity supply systems.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC/TS 61400-13	- ¹⁾	Wind turbine generator systems Part 13: Measurement of mechanical loads	-	-
IEC/TS 61400-23	- ¹⁾	Wind turbine generator systems Part 23: Full-scale structural testing of rotor blades	-	-
IEC 61643-1 (mod)	- ¹⁾	Low-voltage surge protective devices Part 1: Surge protective devices connected to low-voltage power distribution systems - Requirements and tests	EN 61643-11	2002 ²⁾
ISO/IEC 17025	2005	General requirements for the competence of testing and calibration laboratories	EN ISO/IEC 17025	2005
ISO 2394	- ¹⁾	General principles on reliability for structures	-	-

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INTERNATIONALE
INTERNATIONAL
STANDARD

CEI
IEC

61400-2

Deuxième édition
Second edition
2006-03

Aérogénérateurs –

**Partie 2:
Exigences en matière de conception
des petits aérogénérateurs**

iTeh STANDARD PREVIEW

Wind turbines – (standards.iteh.ai)

Part 2: [SIST EN 61400-2:2006](https://standards.iteh.ai/catalog/standards/sist/2a2a2b4-0d7f-416a-961b-000b17c57b9f/sist-en-61400-2-2006)

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**Design requirements for small
wind turbines**

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International Electrotechnical Commission
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For price, see current catalogue

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

WIND TURBINES –

Part 2: Design requirements for small wind turbines

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61400-2 has been prepared by IEC technical committee 88: Wind turbines.

This second edition cancels and replaces the first edition published in 1996. This edition constitutes a technical revision. Numerous substantive changes have been made. The most significant of these are:

- revised simplified equations based upon recent test and research results;
- several parameters in the simplified equations shall now be based upon test results;
- added option for use of aeroelastic models instead of simplified equations;
- expanded testing requirements.

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

FDIS	Report on voting
88/254/FDIS	88/259/RVD

Full information on the voting for the approval of this standard 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.

IEC 61400 consists of the following parts, under the general title *Wind turbines*:

- Part 1: Design requirements
- Part 2: Design requirements for small wind turbines
- Part 3: Design requirements for offshore wind turbines¹
- Part 11: Acoustic noise measurement techniques
- Part 12: Wind turbine power performance testing
- Part 12-1: Power performance measurements of electricity producing wind turbines
- Part 13: Measurement of mechanical loads
- Part 14: Declaration of apparent sound power level and tonality values
- Part 21: Measurement and assessment of power quality characteristics of grid connected wind turbines
- Part 23: Full-scale structural testing of rotor blades
- Part 24: Lightning protection [SIST EN 61400-2:2006](#)
- Part 25-1: Communications for monitoring and control of wind power plants – Overall description of principles and models¹ <http://standards.iteh.ai/catalog/standards/sist/2140fd7c-425a-061b-0001-757b9f800000/61400-2-2006>
- Part 25-2: Communications for monitoring and control of wind power plants – Information models¹
- Part 25-3: Communications for monitoring and control of wind power plants – Information exchange models¹
- Part 25-4: Communications for monitoring and control of wind power plants – Mapping to XML based communication profile¹
- Part 25-5: Communications for monitoring and control of wind power plants – Conformance testing¹

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

¹ Under consideration.

WIND TURBINES –

Part 2: Design requirements for small wind turbines

1 Scope

This part of IEC 61400 deals with safety philosophy, quality assurance, and engineering integrity and specifies requirements for the safety of Small Wind Turbines (SWTs) including design, installation, maintenance and operation under specified external conditions. Its purpose is to provide the appropriate level of protection against damage from hazards from these systems during their planned lifetime.

This part of IEC 61400 is concerned with all subsystems of SWT such as protection mechanisms, internal electrical systems, mechanical systems, support structures, foundations and the electrical interconnection with the load.

While this part of IEC 61400 is similar to IEC 61400-1, it does simplify and make significant changes in order to be applicable to small turbines.

This part of IEC 61400 applies to wind turbines with a rotor swept area smaller than 200 m², generating at a voltage below 1 000 V a.c. or 1 500 V d.c.

This part of IEC 61400 should be used together with the appropriate IEC and ISO standards (see Clause 2).

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2 Normative references

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The following referenced documents are indispensable 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 60034-2, *Rotating electrical machines – Part 2: Methods for determining losses and efficiency of rotating electrical machinery from tests (excluding machines for traction vehicles)*

IEC 60034-5, *Rotating electrical machines – Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) – Classification*

IEC 60034-8, *Rotating electrical machines – Part 8: Terminal markings and direction of rotation*

IEC 60038:1983, *IEC standard voltages*

Amendment 1 (1994)

Amendment 2 (1997)

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

IEC 60364-5-54, *Electrical installations of buildings – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements, protective conductors and protective bonding conductors*

IEC 60721-2-1, *Classification of environmental conditions – Part 2-1: Environmental conditions appearing in nature – Temperature and humidity*

IEC 61400-1, *Wind turbines – Part 1: Design requirements*

IEC 61400-12-1, *Wind turbines – Part 12-1: Power performance measurements of electricity producing wind turbines*

IEC 61400-13, *Wind turbine generator systems – Part 13: Measurement of mechanical loads*

IEC 61400-23, *Wind turbine generator systems – Part 23: Full-scale structural testing of rotor blades*

IEC 61643-1, *Low-voltage surge protective devices – Part 1: Surge protective devices connected to low-voltage power distribution systems – Requirements and tests*

ISO/IEC 17025:2005, *General requirements for the competence of testing and calibration laboratories*

ISO 2394, *General principles on reliability for structures*

3 Terms and definitions

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

3.1

annual average

mean value of a set of measured data of sufficient size and duration to serve as an estimate of the expected value of the quantity

NOTE The averaging time interval shall be an integer number of years to average out non-stationary effects such as seasonality.

3.2

annual average wind speed

wind speed averaged according to the definition of annual average

3.3

auto-reclosing cycles

event with a time period, varying from approximately 0,01 s to a few seconds, during which a breaker released after a grid fault is automatically reclosed and the line is reconnected to the network

3.4

brake (for wind turbines)

device capable of reducing the rotor speed or stopping rotation

3.5**catastrophic failure** (for wind turbines)

disintegration or collapse of a component or structure, that results in loss of vital function which impairs safety

3.6**characteristic value** (of a material property)

value having a prescribed probability of not being attained in a hypothetical unlimited test series

3.7**control system** (for wind turbines)

sub-system that receives information about the condition of the wind turbine and/or its environment and adjusts the turbine in order to maintain it within its operating limits

3.8**cut-in wind speed** V_{in}

lowest mean wind speed at hub height at which the wind turbine produces power

3.9**cut-out wind speed** V_{out}

highest mean wind speed at hub height at which the wind turbine is designed to produce power

3.10**design limits**

maximum or minimum values used in a design

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3.11**design situation**

possible mode of wind turbine operation, for example power production, parking, etc.

3.12**design wind speed**

wind speed used as input for the simple design equations (equal to $1,4 V_{ave}$)

3.13**downwind**

in the main wind direction

3.14**emergency shutdown** (for wind turbines)

rapid shutdown of the wind turbine triggered by a protection system or by manual intervention

3.15**environmental conditions**

characteristics of the environment (altitude, temperature, humidity, etc.) which may affect the turbine system behaviour