

Svenska Elektriska Kommissionen, SEK

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Vindkraftverk – Del 1: Säkerhetsfordringar

*Wind turbines –
Part 1: Design requirements*

Som svensk standard gäller europastandarden EN 61400-1:2005. Den svenska standarden innehåller den officiella engelska språkversionen av EN 61400-1:2005.

Nationellt förord

Europastandarden EN 61400-1:2005

består av:

- **europastandardens ikraftsättningsdokument**, utarbetad inom CENELEC
- **IEC 61400-1, Third edition, 2005 - Wind turbines - Part 1: Design requirements**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare fastställd svensk standard SS-EN 61400-1, utgåva 1, 2004, gäller ej fr o m 2006-11-01.

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a säkerhet, prestanda, dokumentation, utförande och skötsel av elprodukter, elanläggningar och metoder. Genom att utforma sådana standarder blir säkerhetskraven tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

Svenska Elektriska Kommissionen, SEK, svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK

Box 1284
164 29 Kista
Tel 08-444 14 00
www.sekom.se

EUROPEAN STANDARD

EN 61400-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2005

ICS 27.180

Supersedes EN 61400-1:2004

English version

Wind turbines
Part 1: Design requirements
(IEC 61400-1:2005)

Eoliennes
Partie 1: Exigences de conception
(CEI 61400-1:2005)

Windenergieanlagen
Teil 1: Auslegungsanforderungen
(IEC 61400-1:2005)

This European Standard was approved by CENELEC on 2005-10-01. 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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 88/228/FDIS, future edition 3 of IEC 61400-1, prepared by IEC TC 88, Wind turbines, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61400-1 on 2005-10-01.

This European Standard supersedes EN 61400-1:2004.

The main changes with respect to EN 61400-1:2004 are listed below:

- the title has been changed to “Design requirements” in order to reflect that the standard presents safety requirements rather than requirements for safety or protection of personnel;
- wind turbine class designations have been adjusted and now refer to reference wind speed and expected value of turbulence intensities only;
- turbulence models have been expanded and include an extreme turbulence model;
- gust models have been adjusted and simplified;
- design load cases have been rearranged and amended;
- the inclusion of turbulence simulations in the load calculations is emphasized and a scheme for extreme load extrapolation has been specified;
- the partial safety factors for loads have been adjusted and simplified;
- the partial safety factors for materials have been amended and specified in terms of material types and component classes;
- the requirements for the control and protection system have been amended and clarified in terms of functional characteristics;
- a new clause on assessment of structural and electrical compatibility has been introduced with detailed requirements for assessment, including information on complex terrain, earthquakes and wind farm wake effects.

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) | 2006-07-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2006-11-01 |

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61400-1:2005 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:

IEC 60034	NOTE	Harmonized in EN 60034 series (not modified).
IEC 60038	NOTE	Harmonized as HD 472 S1:1989 (modified).
IEC 60146	NOTE	Harmonized in EN 60146 series (not modified).
IEC 60173	NOTE	Harmonized as HD 27 S1:1978 (not modified).
IEC 60227	NOTE	The HD 21 series is related to, but not directly equivalent with the IEC 60227 series.
IEC 60245	NOTE	The HD 22 series is related to, but not directly equivalent with the IEC 60245 series.
IEC 60269	NOTE	Harmonized in EN/HD 60269 series (modified).
IEC 60439	NOTE	Harmonized in EN 60439 series (not modified).
IEC 60446	NOTE	Harmonized as EN 60446:1999 (not modified).
IEC 60529	NOTE	Harmonized as EN 60529:1991 (not modified).
IEC 60898	NOTE	Harmonized in EN 60898 series (modified).
IEC 61310-1	NOTE	Harmonized as EN 61310-1:1995 (not modified).
IEC 61310-2	NOTE	Harmonized as EN 61310-2:1995 (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 Where 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 60204-1	1997	Safety of machinery - Electrical equipment of machines Part 1: General requirements	EN 60204-1 + corr. September	1997 1998
IEC 60204-11	2000	Part 11: Requirements for HV equipment for voltages above 1 000 V a.c. or 1 500 V d.c. and not exceeding 36 kV	EN 60204-11	2000
IEC 60364 (mod)	Series	Electrical installations of buildings	EN 60364 HD 60364 HD 384	Series Series Series
IEC 60721-2-1	1982	Classification of environmental conditions Part 2: Environmental conditions appearing in nature - Temperature and humidity	HD 478.2.1 S1 ¹⁾	1989
IEC 61000-6-1 (mod)	1997	Electromagnetic compatibility (EMC) Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments	EN 61000-6-1	2001
IEC 61000-6-2 (mod)	1999	Part 6-2: Generic standards - Immunity for industrial environments	EN 61000-6-2 ²⁾	2001
IEC 61000-6-4 (mod)	1997	Part 6-4: Generic standards - Emission standard for industrial environments	EN 61000-6-4	2001
IEC 61024-1	1990	Protection of structures against lightning Part 1: General principles	-	-
IEC 61312-1	1995	Protection against lightning electromagnetic impulse Part 1: General principles	-	-
IEC 61400-21	2001	Wind turbine generator systems Part 21: Measurement and assessment of power quality characteristics of grid connected wind turbines	EN 61400-21	2002

¹⁾ HD 478.2.1 S1 includes A1:1987 to IEC 60721-2-1:1982.

²⁾ EN 61000-6-2:2001 is superseded by EN 61000-6-2:2005, which is based on IEC 61000-6-2:2005.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC/TR 61400-24	2002	Part 24: Lightning protection	-	-
ISO 76	1987	Rolling bearings - Static load ratings	-	-
ISO 281	1990	Rolling bearings - Dynamic load ratings and rating life	-	-
ISO 2394	1998	General principles on reliability for structures	-	-
ISO 2533	1975	Standard atmosphere	-	-
ISO 4354	1997	Wind actions on structures	-	-
ISO 6336-1	1996	Calculation of load capacity of spur and helical gears Part 1: Basic principles, introduction and general influence factors	-	-
ISO 9001	2000	Quality management systems - Requirements	EN ISO 9001	2000

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WIND TURBINES –

Part 1: Design requirements

1 Scope

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

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

This standard applies to wind turbines of all sizes. For small wind turbines IEC 61400-2 may be applied.

This standard should be used together with the appropriate IEC and ISO standards mentioned in Clause 2.

2 Normative references

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 60204-1:1997, *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 a.c. or 1 500 V d.c. and not exceeding 36 kV*

IEC 60364 (all parts), *Electrical installations of buildings*

IEC 60721-2-1:1982, *Classification of environmental conditions – Part 2: Environmental conditions appearing in nature. Temperature and humidity*

IEC 61000-6-1:1997, *Electromagnetic compatibility (EMC) – Part 6: Generic standards – Section 1: Immunity for residential, commercial and light-industrial environments*

IEC 61000-6-2:1999, *Electromagnetic compatibility (EMC) – Part 6: Generic standards – Section 2: Immunity for industrial environments 15*

IEC 61000-6-4:1997, *Electromagnetic compatibility (EMC) – Part 6: Generic standards – Section 4: Emission standard for industrial environments*

IEC 61024-1:1990, *Protection of structures against lightning – Part 1: General principles*

IEC 61312-1:1995, *Protection against lightning electromagnetic impulse – Part 1: General principle*

IEC 61400-21:2001, *Wind turbine generator systems – Part 21: Measurement and assessment of power quality characteristics of grid connected wind turbines*