



BSI Standards Publication

Wind turbines

Part 11: Acoustic noise measurement techniques

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National foreword

This British Standard is the UK implementation of EN 61400-11:2013+A1:2018. It is identical to IEC 61400-11:2012, incorporating amendment 1:2018 and corrigendum October 2019.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment A1 is indicated by $\boxed{A1}$ $\langle A1 \rangle$.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by IEC corrigendum October 2019 is indicated in the text by $\boxed{AC1}$ $\langle AC1 \rangle$.

The UK participation in its preparation was entrusted to Technical Committee PEL/88, Wind turbines.

A list of organizations represented on this committee can be obtained on request to its secretary.

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© The British Standards Institution 2019
Published by BSI Standards Limited 2019

ISBN 978 0 539 06898 6

ICS 27.180; 17.140.20

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 April 2013.

Amendments/corrigenda issued since publication

Date	Text affected
31 October 2018	Implementation of IEC amendment 1:2018 with CENELEC endorsement A1:2018
31 October 2019	Implementation of IEC corrigendum October 2019

EUROPÄISCHE NORM

August 2018

ICS 27.180

English Version

Wind turbines – Part 11: Acoustic noise measurement techniques (IEC 61400-11:2012)

Eoliennes – Partie 11: Techniques de mesure du bruit acoustique (CEI 61400-11:2012)

Windenergieanlagen – Teil 11: Schallmessverfahren (IEC 61400-11:2012)

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European Foreword

The text of document 88/436/FDIS, future edition 3 of IEC 61400-11, prepared by IEC/TC 88 "Wind Turbines" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61400-11:2013.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2013-09-12
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2015-12-12

This document supersedes EN 61400-11:2003 + A1:2006.

EN 61400-11:2013 includes the following significant technical changes with respect to EN 61400-11:2003 + A1:2006:

The technical change is introducing new principles for data reduction procedures.

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The text of the International Standard IEC 61400-11:2012 was approved by CENELEC as a European Standard without any modification.

European foreword to amendment A1

The text of document 88/615/CDV, future edition 1 of IEC 61400-11:2012/A1, prepared by IEC/TC 88 "Wind energy generation systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61400-11:2013/A1:2018.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2019-04-20
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2021-07-20

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Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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.

Publication	Year	Title	EN/HD	Year
IEC 60688	-	Electrical measuring transducers for converting A.C. and D.C. electrical quantities to analogue or digital signals	EN 60688	-
IEC 60942	2003	Electroacoustics – Sound calibrators	EN 60942	2003
IEC 61260	1995	Electroacoustics – Octave-band and fractional-octave-band filters	EN 61260	1995
IEC 61400-12-1	2005	Wind turbines – Part 12-1: Power performance measurements of electricity producing wind turbines	EN 61400-12-1	2006
IEC 61400-12-2	- ¹⁾	Wind turbines – Part 12-2: Power performance of electricity producing wind turbines based on nacelle anemometry	EN 61400-12-2	-
IEC 61672	Series	Electroacoustics – Sound level meters	EN 61672	Series
ISO/IEC Guide 98-3	-	Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)		-

¹⁾ To be published.

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FOREWORD

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International Standard IEC 61400-11 has been prepared by IEC technical committee 88: Wind turbines.

This third edition of IEC 61400-11 cancels and replaces the second edition published in 2002 and its Amendment 1 (2006). It constitutes a technical revision, introducing new principles for data reduction procedures.

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

FDIS	Report on voting
88/436/FDIS	88/440/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.

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

A list of all parts of the IEC 61400 series, under the general title *Wind turbines*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability 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.

A bilingual edition of this document may be issued at a later date.

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INTRODUCTION

The purpose of this part of IEC 61400 is to provide a uniform methodology that will ensure consistency and accuracy in the measurement and analysis of acoustical emissions by wind turbine generator systems. This International Standard has been prepared with the anticipation that it would be applied by:

- wind turbine manufacturers striving to meet well defined acoustic emission performance requirements and/or a possible declaration system (e.g. IEC/TS 61400-14);
- wind turbine purchasers for specifying performance requirements;
- wind turbine operators who may be required to verify that stated, or required, acoustic performance specifications are met for new or refurbished units;
- wind turbine planners or regulators who must be able to accurately and fairly define acoustical emission characteristics of a wind turbine in response to environmental regulations or permit requirements for new or modified installations.

This standard provides guidance in the measurement, analysis and reporting of complex acoustic emissions from wind turbine generator systems. The standard will benefit those parties involved in the manufacture, installation, planning and permitting, operation, utilization, and regulation of wind turbines. The measurement and analysis techniques recommended in this document should be applied by all parties to ensure that continuing development and operation of wind turbines is carried out in an atmosphere of consistent and accurate communication relative to environmental concerns. This standard presents measurement and reporting procedures expected to provide accurate results that can be replicated by others.

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INTRODUCTION to the Amendment

This amendment to IEC 61400-11:2012 addresses the situation where a measurement consists of measurements series on different days or with substantially different conditions. Furthermore, clarifications have been introduced on tonality analysis and reporting. Editorial changes have been made.

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Wind turbines —

Part 11: Acoustic noise measurement techniques

1 Scope

This part of IEC 61400 presents measurement procedures that enable noise emissions of a wind turbine to be characterised. This involves using measurement methods appropriate to noise emission assessment at locations close to the machine, in order to avoid errors due to sound propagation, but far away enough to allow for the finite source size. The procedures described are different in some respects from those that would be adopted for noise assessment in community noise studies. They are intended to facilitate characterisation of wind turbine noise with respect to a range of wind speeds and directions. Standardisation of measurement procedures will also facilitate comparisons between different wind turbines.

The procedures present methodologies that will enable the noise emissions of a single wind turbine to be characterised in a consistent and accurate manner. These procedures include the following:

- location of acoustic measurement positions;
- requirements for the acquisition of acoustic, meteorological, and associated wind turbine operational data;
- analysis of the data obtained and the content for the data report; and
- definition of specific acoustic emission parameters, and associated descriptors which are used for making environmental assessments.

This International Standard is not restricted to wind turbines of a particular size or type. The procedures described in this standard allow for the thorough description of the noise emission from a wind turbine. A method for small wind turbines is described in [Annex F](#).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60688, *Electrical measuring transducers for converting a.c. electrical quantities to analogue or digital signals*

IEC 60942:2003, *Electroacoustics — Sound calibrators*

IEC 61260:1995, *Electroacoustics — Octave-band and fractional-octave-band filters*

IEC 61400-12-1:2005, *Wind turbines — Part 12-1: Power performance measurements of electricity producing wind turbines*

IEC 61400-12-2, *Wind turbines — Part 12-2: Power performance verification of electricity producing wind turbines*¹⁾

IEC 61672 (all parts), *Electroacoustics — Sound level meters*

1) To be published.