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TUULETURBIINID. OSA 11: AKUSTILISE MÜRA MÕÕTMISMEETODID

Wind turbines - Part 11: Acoustic noise measurement techniques (IEC 61400-11:2012 + IEC 61400-11:2012/A1:2018)

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See Eesti standard EVS-EN 61400-11:2013 +A1:2018 sisaldab Euroopa standardi EN 61400-11:2013 ja selle muudatuse A1:2018 ingliskeelset teksti.	This Estonian standard EVS-EN 61400-11:2013+A1:2018 consists of the English text of the European standard EN 61400-11:2013 and its amendment A1:2018.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas. Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 01.03.2013, muudatus A1 17.08.2018.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation. Date of Availability of the European standard is 01.03.2013, for A1 17.08.2018.
Muudatusega A1 lisatud või muudetud teksti algus ja lõpp on tekstis tähistatud sümbolitega [A1] ⟨A1⟩. Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest.	The start and finish of text introduced or altered by amendment A1 is indicated in the text by tags [A1] ⟨A1⟩. The standard is available from the Estonian Centre for Standardisation and Accreditation.

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ICS 27.180

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61400-11 + A1

March 2013, August 2018

ICS 27.180

Supersedes EN 61400-11:2003 + A1:2006

English Version

Wind turbines - Part 11: Acoustic noise measurement techniques (IEC 61400-11:2012 + IEC 61400-11:2012/A1:2018)

Eoliennes - Partie 11: Techniques de mesure du bruit acoustique
(CEI 61400-11:2012 + IEC 61400-11:2012/A1:2018)

Windenergieanlagen - Teil 11: Schallmessverfahren
(IEC 61400-11:2012 + IEC 61400-11:2012/A1:2018)

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN 61400-11:2013 E +
EN 61400-11:2013/A1:2018 E

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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A1 Amendment A1 European foreword

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IEC 61400-11

Edition 3.1 2018-06

CONSOLIDATED VERSION

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Wind turbines –
Part 11: Acoustic noise measurement techniques

IEC 61400-11:2012-11+AMD1:2018-06 CSV(en)

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IEC 61400-11

Edition 3.1 2018-06

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Wind turbines –
Part 11: Acoustic noise measurement techniques

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 27.180

ISBN 978-2-8322-5826-2

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WIND TURBINES –

Part 11: Acoustic noise measurement techniques

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.

This bilingual version (2019-01) corresponds to the monolingual English version, published in 2012-11.

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.

The French version of this standard has not been voted upon.

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.

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Amendment A1 FOREWORD

This amendment has been prepared IEC technical committee 88: Wind energy generation systems.

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

CDV	Report on voting
88/615/CDV	88/644A/RVC

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The committee has decided that the contents of this amendment and the base 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

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The contents of the corrigendum of October 2019 have been included in this copy.

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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.

INTRODUCTION to the Amendment A1

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.

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*

ISO/IEC Guide 98-3, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

3 Terms and definitions

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

3.1
apparent sound power level
L_{WA}
A-weighted sound power level re. 1 pW of a point source at the rotor centre with the same emission in the downwind direction as the wind turbine being measured, L_{WA} is determined at bin centre wind speeds at hub height

Note 1 to entry: Apparent sound power level is expressed in dB re. 1 pW.

3.2
apparent sound power level with reference to wind speed at 10 m height
$L_{WA,10m}$
A-weighted sound power level re. 1 pW of a point source at the rotor centre with the same emission in the downwind direction as the wind turbine being measured, $L_{WA,10m}$ are determined at bin centre wind speeds at 10 m height within the measured wind speed range

Note 1 to entry: Apparent sound power level with reference to wind speed at 10 m height is expressed in dB re. 1 pW.

3.3
audibility criterion
L_a
frequency dependent criterion curve determined from listening tests, and reflecting the subjective response of a “typical” listener to tones of different frequencies

Note 1 to entry: Audibility criterion is expressed in dB re. 20 μPa.

3.4 sound pressure levels

3.4.1 A-weighted sound pressure levels

L_A
sound pressure levels measured with the A frequency weighting networks specified in IEC 61672

Note 1 to entry: A-weighted sound pressure levels are expressed in dB re. 20 μPa.

3.4.2 C-weighted sound pressure levels

L_C
sound pressure levels measured with the C frequency weighting networks specified in IEC 61672

Note 1 to entry: C-weighted sound pressure levels are expressed in dB re. 20 μPa.

[1] To be published.