SLOVENSKI PREDSTANDARD

SIST EN 61400-11:2003/oprA1:2005

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Sistemi generatorjev za vetrne turbine – 11. del: Tehnike merjenja hrupa

Wind turbine generator systems – Part 11: Acoustic noise measurement techniques

ICS 17.140.20; 27.180

Referenčna številka
SIST EN 61400-11:2003/oprA1:2005(en)

88/225/CDV

COMMITTEE DRAFT FOR VOTE (CDV)
PROJET DE COMITÉ POUR VOTE (CDV)

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Also of interest to the following committees Intéresse également les comités suivants	Supersedes document Remplace le document 88/190/CD - 88/198A/CC	
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Title : Amendment 1 to IEC 61400-11 Ed. 2: Wind turbine generator systems - Part 11: Acoustic noise measurement techniques

Introductory note

Following circulation as a CD comments have been received, which have been addressed by MT 11. Resulting from this is the document below.

ATTENTION	ATTENTION
CDV soumis en parallèle au vote (CEI) et à l'enquête (CENELEC)	**Parallel IEC CDV/CENELEC Enquiry**

Scope

This amendment to 61400-11 ed. 2 addresses special cases where 95 % of rated power is reached below 10 m/s at 10 m height and for sites where wind speeds of 10 m/s at 10 m height are very rare. Furthermore a clarification on regression analysis and frequency weighting is included.

Amendment 1

5 Outline of method

Add the following sentences after the paragraph of "Measurements of sound pressure levels and wind speeds are made … the apparent sound power levels" in page 10 of the standard:

If the standard is used for verification that actual noise emission is in accordance with a reference/declared noise level, the verification measurement shall be made in accordance with the present standard for a wind speed range given by

- Annual average wind speed at 10 m height onsite ±1 m/s as a minimum. As a minimum three integer wind speed values and 8 m/s shall be reported (i.e. site average = 4.8 m/s, use 4, 5, 6, and 8 m/s).
- If the declaration measurements indicate that audible tones are present at other wind speeds, these wind speeds shall be included as well.

Where local codes or contracts between parties involved (i.e. manufacturers, developers, owners) require measurements at a different wind speed or wind speed range, the present standard shall be applied at those wind speeds.

Amendment 2

7.2.2.3 Narrow band measurements

Contents of 7.2.2.3 of the ed. 2 shall be replaced by the following sentences:

For each integer wind speed, at least two minutes of A-weighted wind turbine noise and background noise are required. These two minutes shall be as close as possible to the integer wind speeds. If the A-weighting cannot be applied during measurement, linear spectra may be converted to A-weighted spectra according to IEC 61672.

Amendment 3

Amendment 3 has additions and changes to several sections as listed.

4 Symbols and units

Add the following.

V_n	wind speed measured by the nacelle anemometer	(m/s)

6.2.1 Non-acoustic Instruments

Add to the end of the section.

Because the nacelle anemometer is in-situ calibrated during measurement, the demand for calibration does not apply to the nacelle anemometer. The measurements from the nacelle anemometer may be supplied from the wind turbine control system. The nacelle anemometer may not be used for background noise measurements.

7.1.2 Acoustic measurements

Add to the end of the section

If 95 % of rated power is reached below a standardized wind speed of 10 m/s and the nacelle anemometer method is chosen, the wind speed from the nacelle anemometer shall be measured. If no nacelle anemometer is available, an anemometer must be mounted on the nacelle. For wind turbines with a hub height below 30 m all wind speed measurements may be taken from an anemometer between 10 m and hub height.

7.3.1.1 Method 1: determination of the wind speed from the electric output and the power curve
Replace the remainder of the section after "If the standardized wind speed corresponding to 95 % …

If the standardised wind speed corresponding to 95% of rated power is below 10 m/s, one of the following two methods shall be used to determine the wind speed for data above 95% of rated power:

7.3.1.1.1 Nacelle anemometer method

For all data points between 5 % and 95 % of rated power, a linear regression using the nacelle wind speed V_n and corrected hub height wind speed determined from electrical power measurements V_H shall be determined. For passive stall turbines, the corrected wind speed at hub height V_H is the derived wind speed from power V_D. For active power controlled turbine, V_H is determined from Equation (5).

The corrected wind speed above 95% of rated power shall be determined applying the resulting linear regression to the nacelle wind speed V_n.

7.3.1.1.2 κ-factor method

For all data points with power levels below 95% of rated power the ratio of standardised wind speed and measured wind speed, κ, shall be derived. This ratio shall then be applied to the measured wind speed of the data points with power levels above 95% of rated power to estimate the standardised wind speed using Equation (6).

$$V_S = \kappa V_Z \qquad (6)$$

where

V_S is the standardised wind speed;

V_Z is the wind speed measured at anemometer height z.

The nacelle anemometer method is the preferred method as the correlation between nacelle wind speed and the electrical power output typically is better than for the wind speed measured below hub height.

9.5 Non-acoustic data
Add the following.

- A plot showing the relation between the nacelle anemometer wind speed V_n and the wind speed at hub height determined from measurements of electrical power V_H.

D.4.1 Apparent sound power level
Add to the bullet "uncertainty on the measured wind speed…"

U_{B7}-values for wind speeds above 95% of rated power.

Amendment 4

7.3.3 Other measurements

Add subsection 7.3.4 in Section 7.3 Non-acoustic measurements of the ed. 2 as follows:
Measurement and reporting of relevant wind turbine control parameters such as rotor speed and pitch angle are recommended. These data may be obtained from the wind turbine controller.

Amendment 5

8.3 Apparent sound power levels

Change the first sentence in 8.3 in the ed.2 as follows:
The analyst may use up to a 4^{th} order regression as long as the correlation coefficient is limited to a value of 0.8 or higher, using the regression with the highest correlation coefficient. If there are no suitable regressions that meet the correlation coefficient limit then bin analysis may be utilized using a linear regression within bins to determine the sound pressure levels at the integer wind speeds. The bins will be 1 m/s wide, open on the low end, closed on the high end. There must be at least one point on both sides of the integer wind speed.