Akustika. Katse-eeskiri pöörlevate elektrimasinate õhumüra mõõtmiseks. Osa 1: Tehniline meetod mõõtmiseks vaba välja tingimustes peegeltasapinna kohal

Acoustics - Test code for the measurement of airborne noise emitted by rotating electrical machinery - Part 1: Engineering method for free-field conditions over a reflecting plane

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 21680-1:1999 sisaldab Euroopa standardi EN 21680-1:1991 ingliskeelset teksti.	This Estonian standard EVS-EN 21680-1:1999 consists of the English text of the European standard EN 21680-1:1991.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 09.10.1991.	Date of Availability of the European standard is 09.10.1991.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

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English version

Acoustics - Test code for the measurement of airborne noise emitted by rotating electrical machinery - Part 1: Engineering methods for free-field conditions over a reflecting plane(Identical with ISO 1680-1:1986)

Acoustique - Code d'essai pour le mesurage du bruit aérien émis par les machines électriques tournantes - Partie 1: Méthode d'expertise pour les conditions de champ libre au-dessus d'un plan réfléchissant (Identique à l'ISO 1680-1:1986)

Akustik - Verfahren zur Messung der Geräuschemission von rotierenden elektrischen Maschinen - Teil 1: Verfahren der Genauigkeitsklasse 2 für Freifeldbedingungen über einer reflektierenden Ebene (Identisch mit 1680-1:1986)

This European Standard was approved by CEN on 1991-10-07 and is identical to the ISO standard as referred to.
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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

This European Standard has been taken over by CEN/TC 211 "Acoustics" from the work of the International Organization for Standardization (ISO).

This document has been submitted to the formal vote and has been approved.

Natonal Standards identical to this European Standard shall be published at the latest by 92-04-09 and conflicting national standards shall be withdrawn at the latest 92-04-09.

In accordance with the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard : Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

Endorsement notice

The text of the International Standard ISO 1680-1:1986 has been approved by CEN as a European Standard without any modification.

International Standard 1680/1

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 1680/1 was prepared by Technical Committee ISO/TC 43, *Acoustics.*

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

It cancels and replaces ISO Recommendation R 1680-1970 of which it constitutes a technical revision.

Acoustics — Test code for the measurement of airborne noise emitted by rotating electrical machinery — Part 1: Engineering method for free-field conditions over a reflecting plane

0 Introduction

This part of ISO 1680 is based on ISO 3744 and has been drafted in accordance with ISO 3740.

The main purpose of this part of ISO 1680 is to specify a clearly defined measurement method for rotating electrical machines operating under steady-state conditions, the results of which can be expressed in sound power levels so that all machines tested using this code can be directly compared. Other methods, such as the precision methods of ISO 3741, 3742 and 3745, may also be used for determining sound power levels if the installation and operating conditions of this part of ISO 1680 are used.

1 Scope and field of application

1.1 General

This part of ISO 1680 specifies, in accordance with ISO 2204, an engineering method (grade 2) for measuring the sound pressure levels on a rectangular parallelepiped surface enveloping the machine and for calculating the sound power level produced by the machine. It outlines the procedures which may be used to evaluate the test environment and specifies the characteristics of suitable measuring instruments. A method is given for determining the A-weighted sound power level and, if required, octave or one-third octave band sound power levels of the machine from the mean of the sound pressure levels measured on the rectangular parallelepiped surface.

This part of ISO 1680 applies to the measurement of airborne noise from rotating electrical machines, such as motors and generators (d.c. and a.c. machines) without any limitation on the output or voltage, when fitted with their normal auxiliaries. It applies to rotating electrical machines with any linear dimension (length, width or height) not exceeding 15 m.

This part of ISO 1680 applies to measurements carried out in environmental conditions that meet the criteria given in clause 4 and annex A (environmental correction $K \leqslant 2$ dB, correction for background noise $\leqslant 1$ dB). If these criteria are not met, standard deviations of the test results may be greater than those given in table 1, i.e. the engineering grade of accuracy may not be achieved. The method given in ISO 1680/2 shall then be used, which will result in A-weighted sound power levels of lower accuracy. In this case, no reference shall be made to this part of ISO 1680.

1.2 Measurement uncertainty

Measurements carried out in conformity with this part of ISO 1680 usually result in standard deviations which are equal to or less than those given in table 1. The standard deviations given in table 1 reflect the cumulative effects of all causes of measurement uncertainty, excluding variations in the sound power level of the machine from test to test. For a machine which emits noise with a relatively "flat" spectrum in the 100 to 10 000 Hz frequency range, the A-weighted sound power level is determined with a standard deviation of approximately 2 dB. For outdoor measurements, the standard deviation in the octave band centred on 63 Hz will be approximately 5 dB.

NOTE — The standard deviations in table 1 include the effects of allowable variations in the positioning of the measurement positions and in the selection of the stipulated measurement surface.

Table 1 — Uncertainty in determining sound power levels for engineering measurements indoors or outdoors

Octave band centre frequencies Hz	One-third octave band centre frequencies Hz	Standard deviation of mean value dB
125	100 to 160	3,0
250 to 500	200 to 630	2,0
1 000 to 4 000	800 to 5 000	1,5
8 000	6 300 to 10 000	2,5

2 References

ISO 266, *Acoustics — Preferred frequencies for measurements.*

ISO 354, *Acoustics — Measurement of sound absorption in a reverberation room.*

ISO 1680/2, *Acoustics — Test code for the measurement of airborne noise emitted by rotating electrical machinery — Part 2: Survey method.*

ISO 2204, *Acoustics — Guide to International Standards on the measurement of airborne acoustical noise and evaluation of its effects on human beings.*

ISO 3740, *Acoustics — Determination of sound power levels of noise sources — Guidelines for the use of basic standards and for the preparation of noise test codes.*

ISO 3741, *Acoustics — Determination of sound power levels of noise sources — Precision methods for broad-band sources in reverberation rooms.*

ISO 3742, *Acoustics — Determination of sound power levels of noise sources — Precision methods for discrete-frequency and narrow-band sources in reverberation rooms.*

ISO 3744, *Acoustics — Determination of sound power levels of noise sources — Engineering methods for free-field conditions over a reflecting plane.*

ISO 3745, *Acoustics — Determination of sound power levels of noise sources — Precision methods for anechoic and semi-anechoic rooms.*

ISO 6926, *Acoustics — Determination of sound power levels of noise sources — Characterization and calibration of reference sound sources.* [1)]

IEC Publication 34-1, *Rotating electrical machines — Part 1: Rating and performance.*

IEC Publication 225, *Octave, half-octave and third-octave band filters intended for the analysis of sounds and vibrations.*

IEC Publication 651, *Sound level meters.*

3 Definitions

For the purposes of this part of ISO 1680, the following definitions apply.

3.1 free field: A sound field in a homogeneous, isotropic medium free of boundaries. In practice, it is a field in which the effects of the boundaries are negligible over the frequency range of interest.

3.2 free field over a reflecting plane: A sound field in the presence of a reflecting plane on which the source is located.

3.3 anechoic room: A test room the surfaces of which absorb essentially all the incident sound energy over the frequency range of interest, thereby affording free-field conditions over the measurement surface.

3.4 semi-anechoic room: A test room with a hard reflecting floor the other surfaces of which absorb essentially all the incident sound energy over the frequency range of interest, thereby affording free-field conditions above a reflecting plane.

3.5 sound pressure level, L_p, in decibels: Twenty times the logarithm to the base 10 of the ratio of the sound pressure to the reference sound pressure. The weighting network or the width of the frequency band and its centre frequency used shall be indicated: for example, A-weighted sound pressure level, $L_{p\mathrm{A}}$, octave band sound pressure level, one-third octave band sound pressure level, etc. The reference sound pressure is 20 μPa.

3.6 surface sound pressure: The sound pressure averaged in time on a mean-square basis and also averaged over the measurement surface using the averaging procedures specified in 8.1 and corrected for the effects of background noise and the influence of reflected sound at the measurement surface.

3.7 surface sound pressure level, $\overline{L_{\mathrm{pf}}}$, in decibels: Ten times the logarithm to the base 10 of the ratio of the square of the surface sound pressure to the square of the reference sound pressure.

3.8 sound power level, L_W, in decibels: Ten times the logarithm to the base 10 of the ratio of a given sound power to the reference sound power. The weighting network or the width of the frequency band used shall be indicated: for example, A-weighted sound power level, $L_{W\mathrm{A}}$, octave band sound power level, one-third octave band sound power level, etc. The reference sound power is 1 pW ($=10^{-12}$ W).

NOTE — The surface sound pressure level is numerically different from the sound power level and its use in lieu of the sound power level is not correct because the size of the measurement surface is not covered by this quantity.

3.9 frequency range of interest: For general purposes, the frequency range of interest includes the octave bands with centre frequencies between 125 and 8 000 Hz or the one-third octave bands with centre frequencies between 100 and 10 000 Hz. Any band may be excluded in which the level is more than 40 dB below the highest band pressure level. For special purposes, the frequency range of interest may be extended at either end, provided that the test environment and instrument accuracy are satisfactory for use over the extended frequency range. For sources which radiate predominantly high (or low) frequency sound, the frequency range of interest may be limited in order to optimize the test facility and procedures.

3.10 measurement surface: A hypothetical surface of area S enveloping the source on which the measurement positions are located and which terminates on the reflecting plane.

3.11 reference box: A hypothetical surface which is the smallest rectangular parallelepiped that just encloses the source and terminates on the reflecting plane.

3.12 measurement distance: The minimum distance from the reference box to the measurement surface.

3.13 background noise: The sound pressure level at each microphone position with the source inoperative.

1) At present at the stage of draft.