SLOVENSKI STANDARD
SIST EN 29295:1999

01-november-1999

Akustika - Merjenje visokofrekvenčnega hrupa računalnikov in pisarniške opreme (ISO 9295:1988)

Acoustics - Measurement of high-frequency noise emitted by computer and business equipment (ISO 9295:1988)

Akustik - Messung von hochfrequentem Geräusch von Geräten der Büro- und Informationstechnik (ISO 9295:1988)

Acoustique - Mesurage du bruit à haute fréquence émis par les matériels informatique et de bureau (ISO 9295:1988)

Ta slovenski standard je istoveten z: **EN 29295:1991**

ICS:

17.140.20	Emisija hrupa naprav in opreme	Noise emitted by machines and equipment
35.020	Informacijska tehnika in tehnologija na splošno	Information technology (IT) in general

SIST EN 29295:1999 **en**

EUROPEAN STANDARD EN 29295:1991

NORME EUROPEENNE

EUROPAISCHE NORM October 1991

UDC 534.6:534.835.463:651.2:681.3

Descriptors : Acoustics, acoustic tests, acoustic measurement, high frequencies, engine noise, office machines, data processing equipment, sound pressure, sound power

English version

Acoustics - Measurement of high-frequency noise emitted by computer and business equipment (Identical to ISO 9295:1988)

Acoustique - Mesurage du bruit à haute fréquence émis par les matériels informatique et de bureau (Identique à l'ISO 9295:1988)

Akustik - Messung von hochfrequentem Geräusch von Geräten der Büro- und Informationstechnik (Identisch mit ISO 9295:1988)

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

CEN 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 CEN 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 CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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 9295:1988 has been approved by CEN as a European Standard without any modification.

INTERNATIONAL STANDARD

ISO
9295

First edition
1988-11-15
Corrected and reprinted
1989-02-01

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

Acoustics — Measurement of high-frequency noise emitted by computer and business equipment

Acoustique — Mesurage du bruit à haute fréquence émis par les matériels informatiques et de bureau

Reference number
ISO 9295 : 1988 (E)

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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 9295 was prepared by the European Computer Manufacturers Association (as Standard ECMA-108) and was adopted, under a special "fast-track procedure", by Technical Committee ISO/TC 43, *Acoustics*, in parallel with its approval by the ISO member bodies.

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.

Printed in Switzerland

Acoustics — Measurement of high-frequency noise emitted by computer and business equipment

0 Introduction

Some computer and business equipment emits high-frequency noise which may be broad-band noise (e.g. paper noise of high-speed printing) or narrow-band noise and discrete tones (e.g. switching power supplies and video display units). The measured levels are not frequency-weighted. However, when there are significant contributions in the octave bands having centre frequencies between 125 Hz and 8 kHz, and, in addition, there is a contribution in the 16 kHz band which is broad-band in character, the A-weighted sound power level may be calculated with the contribution of the 16 kHz octave band included. The principal objective of this International Standard is to prescribe methods for measuring the levels and frequencies of tones which are contained within the 16 kHz octave band.

1 Scope and field of application

This International Standard specifies four methods for the determination of the sound power levels of high-frequency noise emitted by computer and business equipment in the frequency range covered by the octave band centred at 16 kHz. They are complementary to the methods described in ISO 7779. The first three methods are based on the reverberation room technique described in clause 5 of ISO 7779 : 1988. The fourth method makes use of a free field over a reflecting plane as described in clause 6 of ISO 7779 : 1988.

The test conditions which prescribe the installation and operation of the equipment are those specified in ISO 7779.

While the four methods described in this International Standard are particularly suitable for computer and business equipment, they may also be applied to other types of equipment. This International Standard specifies methods for the determination of sound power levels in the frequency range covered by the octave band centred at 16 kHz which includes frequencies between 11,2 kHz and 22,4 kHz.

NOTE — The sound power level in the 16 kHz octave band determined according to this International Standard typically is subject to a standard deviation of approximately 3 dB.

A method for the measurement of high-frequency noise is in conformance with this International Standard if it satisfies all the mandatory requirements of one of the four methods described herein and if the information recorded and reported is that specified in clauses 8, 9 and 10, respectively.

2 References

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

ISO 7779, *Acoustics — Measurement of airborne noise emitted by computer and business equipment.*

3 Requirements for measurements in a reverberation room

3.1 General

Three methods are described using the reverberation room technique of clause 5 of ISO 7779 : 1988. The first and the second methods are usually called "direct" methods because they use directly measured or calculated reverberation times. The third method is a so-called comparison method. A calibrated reference sound source is used from which the sound power levels of the equipment are determined by comparison.

All three methods require a determination of the average sound pressure level in the reverberant field.

As instrumentation and basic measurement techniques are the same for all three methods, they are summarized in 3.2 to 3.6. Additional requirements specific to each method are given separately. For additional information on instrumentation, refer to ISO 7779.

3.2 Instrumentation

The microphone shall have a flat frequency response for randomly incident sound in the 16 kHz octave band. The tolerances shall be within ± 2,0 dB in the frequency range 11,4 kHz to 22,8 kHz.

NOTE — To meet this requirement, a microphone with a diameter of 13 mm or less is usually required.

1) To be published.

When the noise of the equipment under test is broad-band in character, an analyser with a bandwidth of one-third octave or less shall be used. When the noise of the equipment under test contains discrete frequencies, a narrow-band analyser which provides bandwidths less than one-third octave in width shall be used to determine the frequency of the tone(s) and to enhance the signal-to-noise ratio.

NOTE — For narrow-band analysis, an analyser with a bandwidth equal to or less than one-twelfth octave is appropriate. Digital analysers using fast Fourier transform (FFT) or equivalent techniques may be useful, particularly when the analyser combines narrow-band analysis and averaging.

3.3 Installation and orientation of microphone

The microphone shall be mounted on the end of a rotating boom traversing a circle with a diameter of at least 2 m. In order to reduce the influence of the direct field on the measured sound pressure level, the microphone shall be mounted on the end of the boom pointing upwards in such a way that the normal to its diaphragm is parallel to the axis of rotation. The period of rotation shall be at least 30 s.

Longer paths and traversing periods than the minimum values may be used to reduce the background noise of the drive mechanism, and to minimize modulation of any discrete tone(s) due to the moving microphone.

Care shall be taken to ensure that there is no electrical pick-up by the measurement instrumentation which would interfere with the sound pressure level measurement.

NOTE — A test with a dummy microphone, and with the equipment under test in operation, is recommended to determine the electrical background level.

3.4 Installation and orientation of equipment

Place the equipment on the floor of the reverberation room, at least 1 m from any wall, and at least 1,8 m from the point of closest approach of the microphone.

Four orientations of the equipment shall be used as follows :

a) Operator side facing the centre of the microphone path.

b) Equipment turned clockwise by 90°.

c) Equipment turned clockwise by 180°.

d) Equipment turned clockwise by 270°.

Alternatively, place the equipment on a turntable and revolve it during the measurements. The motion of the turntable shall not be synchronous with the rotation of the microphone boom.

3.5 Calibration of measurement system

Before the measurement of the equipment noise, the measurement set-up shall be calibrated according to 5.4.6 of ISO 7779 : 1988. Calibration at a single frequency is sufficient if the frequency response of the entire system, including the frequency range of the 16 kHz octave band, is checked at intervals of not more than two years.

If an FFT analyser is calibrated with a single-frequency calibrator, care shall be taken to have all major sideband levels included in the calibration level.

3.6 Measurement of sound pressure level

The sound pressure level is measured in one-third octave bands or in narrow bands which include any discrete tones. Measurements of the sound pressure level along the circular microphone path shall be carried out for each frequency band within the frequency range of interest. The following data shall be obtained :

a) The band sound pressure levels with the equipment in operation.

b) The band sound pressure levels of the background noise (including noise produced by ancillary equipment, if any).

c) The band sound pressure levels of the reference sound source (if required : see clause 6).

True integration-averaging during a full sweep of the microphone is the preferred method. When using a narrow-band analyser that performs the analysis in consecutive time periods, each time period shall correspond to one revolution. The influence of measurement duration and corrections for background noise shall be taken into account according to 5.7 of ISO 7779 : 1988.

When FFT analysers are used, the analysis time is typically greater than the individual time window. For this reason, the total measurement time shall be increased, or individual measurements shall be repeated for three revolutions of the boom, each for a different starting point.

The average value, L_p, of N measurements of the sound pressure level shall be calculated using the equation :

$$L_p = 10 \lg \left[\frac{1}{N} \sum_{i=1}^{N} 10^{(L_i/10)} \right] \qquad \ldots(1)$$

where L_i is the sound pressure level, in decibels (reference : 20 µPa) for the ith measurement.

For the four orientations of the equipment under test, the average value of L_p is obtained with $N = 4$. For the three revolutions of the boom, L_p is obtained using $N = 3$.

When a discrete tone is analysed, the moving microphone distributes the energy of the tone into sidebands of the tone frequency. In order to obtain the total level, the analyser bandwidth shall not be less than :