

ELEKTROAKUSTIKA. AUDIOMEETRID. OSA 1: PUHTA
SIINUSTOONI AUDIOMEETRID JA KÕNEAUDIOMEETRIA
SEADMESTIK

Electroacoustics - Audiometric equipment - Part 1:
Equipment for pure-tone and speech audiometry

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 60645-1:2017 sisaldab Euroopa standardi EN 60645-1:2017 ingliskeelset teksti.	This Estonian standard EVS-EN 60645-1:2017 consists of the English text of the European standard EN 60645-1:2017.
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English Version

Electroacoustics - Audiometric equipment - Part 1: Equipment for pure-tone and speech audiometry (IEC 60645-1:2017)

Electroacoustique - Appareils audiométriques -
Partie 1: Appareils pour l'audiométrie tonale et vocale
(IEC 60645-1:2017)

Akustik - Audiometer - Teil 1: Reinton-Audiometer
(IEC 60645-1:2017)

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European foreword

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This document supersedes EN 60645-1:2015.

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Endorsement notice

The text of the International Standard IEC 60645-1:2017 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

ISO 389-9 NOTE Harmonized as EN ISO 389-9.

CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms and definitions	9
4 Requirements by type and class of audiometer.....	13
5 General requirements	15
5.1 General safety requirements	15
5.2 Acoustic safety requirements	15
5.3 Environmental conditions	15
5.4 Warm-up time	15
5.5 Power supply variation.....	15
5.5.1 Interruption of power supply	15
5.5.2 Mains operation.....	15
5.5.3 Battery operation.....	15
5.5.4 Other power supplies.....	16
5.6 Electromagnetic compatibility.....	16
5.7 Unwanted sound	16
5.7.1 General	16
5.7.2 Unwanted sound from and between any combination of transducers.....	16
5.7.3 Unwanted sound from an earphone	16
5.7.4 Unwanted sound from a bone vibrator.....	16
5.7.5 Unwanted sound radiated by an audiometer	17
5.8 Testing of automatic-recording audiometers.....	17
5.9 Interface connections.....	17
6 Test signals.....	17
6.1 Speech signals	17
6.1.1 Speech signal general requirements	17
6.1.2 Free-field equivalent earphone output level	17
6.1.3 Uncorrected earphone output level	18
6.1.4 Loudspeaker output level.....	18
6.1.5 Bone vibrator output level.....	18
6.1.6 Speech signal frequency response	18
6.1.7 Calibration signal.....	18
6.1.8 Live voice microphone frequency response.....	18
6.1.9 Scale reference and output level.....	19
6.1.10 Distortion requirements for speech signals	19
6.2 Pure tones	20
6.2.1 Frequency range and hearing level range	20
6.2.2 Frequency acceptance limits.....	21
6.2.3 Total harmonic distortion	21
6.2.4 Rate of frequency change.....	21
6.2.5 Frequency modulation	21
6.3 External signal sources	22
6.3.1 Signals	22
6.3.2 Frequency response	22

6.3.3	Playback device input	22
6.3.4	Signal-to-noise ratio for playback device input	22
6.3.5	Electrical sensitivity	22
6.3.6	Reference level for external signal source	23
6.4	Operator and test subject speech communication	23
6.4.1	General	23
6.4.2	Operator to test subject speech communication (talk-forward)	23
6.4.3	Test subject to operator speech communication (talk-back)	23
6.4.4	Operator to test subject speech communication for live voice speech audiometry	23
6.4.5	Test subject to operator speech communication for vocal response speech audiometry	24
6.5	Masking sound	24
6.5.1	General	24
6.5.2	Narrow-band noise	24
6.5.3	Speech weighted noise	26
6.5.4	Other masking sound	26
7	Transducers	26
7.1	Types of transducers	26
7.2	Headband	26
7.3	Loudspeaker	26
8	Signal level control	26
8.1	Marking of pure-tone and speech signal level controls	26
8.2	Signal indicator	27
8.3	Sound pressure level and vibratory force level acceptance limits	27
8.4	Signal level control	28
8.4.1	Manual audiometers	28
8.4.2	Automatic-recording audiometers	28
8.4.3	Signal level control acceptance limits	28
8.5	Masking sound level control	28
8.5.1	General	28
8.5.2	Masking sound level	28
8.5.3	Masking sound level acceptance limits	29
8.5.4	Masking sound level range	29
8.6	Signal switching	29
8.6.1	Signal switch for manual audiometers	29
8.6.2	On/off ratio for manual audiometers	29
8.6.3	Rise/fall times for manual audiometers	29
8.6.4	Automatic pulsed presentation	30
8.6.5	Subject's response system	30
8.6.6	Subject's response time for automated test procedures	30
9	Reference tone	31
9.1	General	31
9.2	Frequencies	31
9.3	Reference tone level control	31
9.3.1	Range	31
9.3.2	Intervals	31
9.3.3	Marking	31
9.3.4	Acceptance limits	31

9.3.5	Operation	31
10	Calibration	31
11	Electrical output of test signals	32
12	Audiogram format	33
13	Test requirements to demonstrate conformity	33
13.1	General.....	33
13.2	Environmental conditions and power supply variation.....	33
13.3	Electromagnetic compatibility.....	34
13.4	Unwanted sound	34
13.4.1	Unwanted sound from an earphone	34
13.4.2	Unwanted sound from a bone vibrator.....	35
13.4.3	Unwanted sound radiated by an audiometer	35
13.5	Total harmonic distortion of test signals	35
13.6	Microphone for live voice speech testing.....	36
13.7	Signal accuracy	36
13.7.1	Accuracy of sound pressure level and vibratory force level	36
13.7.2	Accuracy of hearing level control	36
13.8	Masking sound.....	36
13.8.1	Narrow-band noise	36
13.8.2	Masking sound level	36
13.9	Headbands	37
13.9.1	General	37
13.9.2	Supra-aural and circumaural earphone headband.....	37
13.9.3	Bone vibrator headband.....	37
14	Maximum permitted expanded uncertainty of measurements U_{\max}	37
15	Marking and instruction manual	38
15.1	Marking.....	38
15.2	Instruction manual	38
Annex A (informative) Relationship between tolerance interval, corresponding acceptance interval and the maximum permitted uncertainty of measurement.....		40
Bibliography.....		41
Figure 1 – Rise/fall envelope of test tones		30
Figure A.1 – Relationship between tolerance interval, corresponding acceptance interval and the maximum permitted uncertainty of measurement		40
Table 1 – Minimum facilities for audiometers		14
Table 2 – Minimum number of frequencies to be provided and the minimum range of values of hearing level for type and class of audiometer		20
Table 3 – Maximum permissible acoustic total harmonic distortion, for supra-aural, circumaural, insert earphones and bone vibrators		21
Table 4 – Narrow-band masking noise: upper and lower cut-off frequencies for a sound pressure spectrum density level of –3 dB referenced to the level at the centre frequency of the band		25
Table 5 – Standards specifying reference equivalent threshold levels		32
Table 6 – Symbols for the graphical presentation of hearing threshold levels.....		33
Table 7 – Values of U_{\max} for basic measurements.....		38

INTRODUCTION

Developments in the field of hearing measurements for diagnostic, hearing conservation and rehabilitation purposes have resulted in the availability of a wide range of audiometers. In addition it is possible to consider the audiometer in terms of a set of functional units which can be specified independently. By specifying these functional units it is then possible to specify the performance of other audiometric equipment which use these units. The IEC 60645 series consists of a number of parts. IEC 60645-1 is the first in the series and covers the requirements for both pure-tone and speech audiometers.

This standard describes the performance requirements for pure-tone audiometers, which are designed for the measurement of hearing in the frequency range from 125 Hz to 16 kHz, and speech audiometers, which are designed for performing live or recorded speech audiometry.

When speech signal facilities are provided by an audiometer, performance requirements are given for both live voice and recorded speech material. Although live voice speech audiometry may not be capable of meeting the requirements of this standard, it is widely practiced, particularly with children, and therefore a specification is included in order to ensure as high a degree of reliability as possible. This standard does not specify the speech material that is used for test purposes or the required acoustic properties of the test room.¹

Speech audiometers use earphones or loudspeakers to present signals to the test subject. In this standard, specifications of the performance characteristics of speech audiometers and relevant calibration and test methods are given with respect to both a free-field equivalent output level method and an uncorrected ear simulator or acoustic coupler output level method.

In order to relate earphone listening to sound field listening, the concept of a free-field equivalent output level of an earphone, as described in IEC 60268-7, is used for specification and measurement purposes.

Although it is recognised that bone vibrators are used for speech audiometry purposes, their performance can be extremely variable when using speech signals. Therefore only known “good practice” specifications for bone conduction using speech signals are provided to promote consistency when this capability is provided.

The test requirements to demonstrate audiometer conformity are now specified separately. Conformance to the performance specification in this standard is demonstrated when a measured deviation from a design goal equals or does not exceed the corresponding acceptance limit(s), and the laboratory has demonstrated that the associated uncertainty of measurement equals or does not exceed the maximum permitted uncertainty specified in this standard. The requirements for an audiometer are essentially the same as in the previous editions of IEC 60645-1 and IEC 60645-2.

¹ These requirements are specified in ISO 8253-1.

ELECTROACOUSTICS – AUDIOMETRIC EQUIPMENT –

Part 1: Equipment for pure-tone and speech audiometry

1 Scope

This part of IEC 60645 specifies general requirements for audiometers designed for use in determining hearing threshold levels, relative to standard reference threshold levels established by means of psychoacoustic test methods, and those designed to perform psychoacoustic tests using speech material.

The object of this standard is to ensure:

- a) that tests of hearing in the frequency range 125 Hz to 16 kHz on a given human ear, performed with different pure-tone audiometers which comply with this standard, give substantially the same results;
- b) that the results obtained represent a valid comparison between the hearing of the ear tested and the reference threshold of hearing;
- c) that a means of presenting speech material to a subject in a standardized manner is provided. This will ensure that tests of hearing using a specific speech signal and a specific manner of signal presentation, when performed with different audiometers which comply with this standard, give substantially the same results;
- d) that audiometers are classified according to the range of test signals they present, according to the mode of operation or according to their presumed primary application.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60268-3, *Sound system equipment – Part 3: Amplifiers*

IEC 60268-7, *Sound system equipment – Part 7: Headphones and earphones*

IEC 60268-17, *Sound system equipment – Part 17: Standard volume indicators*

IEC 60318-1, *Electroacoustics – Simulators of human head and ear – Part 1: Ear simulator for the measurement of supra-aural and circumaural earphones*

IEC 60318-3, *Electroacoustics – Simulators of human head and ear – Part 3: Acoustic coupler for the calibration of supra-aural earphones used in audiometry*

IEC 60318-4, *Electroacoustics – Simulators of human head and ear – Part 4: Occluded-ear simulator for the measurement of earphones coupled to the ear by means of ear inserts*

IEC 60318-5, *Electroacoustics – Simulators of human head and ear – Part 5: 2 cm³ coupler for the measurement of hearing aids and earphones coupled to the ear by means of ear inserts*

IEC 60318-6, *Electroacoustics – Simulators of human head and ear – Part 6: Mechanical coupler for the measurement of bone vibrators*

IEC 60601-1, *Medical electrical equipment – Part 1: General requirements for basic safety and essential performance*

IEC 60601-1-2, *Medical electrical equipment – Part 1-2: General requirements for basic safety and essential performance – Collateral standard: Electromagnetic disturbances – Requirements and tests*

IEC 61260-1, *Electroacoustics – Octave-band and fractional-octave-band filters – Part 1: Specifications*

IEC 61672-1, *Electroacoustics – Sound level meters – Part 1: Specifications*

ISO 266, *Acoustics – Preferred frequencies*

ISO 389-1, *Acoustics – Reference zero for the calibration of audiometric equipment – Part 1: Reference equivalent threshold sound pressure levels for pure tones and supra-aural earphones*

ISO 389-2, *Acoustics – Reference zero for the calibration of audiometric equipment – Part 2: Reference equivalent threshold sound pressure levels for pure tones and insert earphones*

ISO 389-3, *Acoustics – Reference zero for the calibration of audiometric equipment – Part 3: Reference equivalent threshold force levels for pure tones and bone vibrators*

ISO 389-4:1994, *Acoustics – Reference zero for the calibration of audiometric equipment – Part 4: Reference levels for narrow-band masking noise*

ISO 389-5, *Acoustics – Reference zero for the calibration of audiometric equipment – Part 5: Reference equivalent threshold sound pressure levels for pure tones in the frequency range 8 kHz to 16 kHz*

ISO 389-7, *Acoustics – Reference zero for the calibration of audiometric equipment – Part 7: Reference threshold of hearing under free-field and diffuse-field listening conditions*

ISO 389-8, *Acoustics – Reference zero for the calibration of audiometric equipment – Part 8: Reference equivalent threshold sound pressure levels for pure tones and circumaural earphones*

ISO 4869-1, *Acoustics – Hearing protectors – Part 1: Subjective method for the measurement of sound attenuation*

ISO 8253-1:2010, *Acoustics – Audiometric test methods – Part 1: Pure-tone air and bone conduction audiometry*

ISO 8253-2, *Acoustics – Audiometric test methods – Part 2: Sound field audiometry with pure-tone and narrow-band test signals*

ISO 8253-3, *Acoustics – Audiometric test methods – Part 3: Speech audiometry*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses: