

ORGANISATION INTERNATIONALE  
DE MÉTROLOGIE LÉGALE

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INTERNATIONAL RECOMMENDATION

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Equipment for speech audiometry

Appareils pour l'audiométrie vocale

OIML R 122

Edition 1996 (E)

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## FOREWORD

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# EQUIPMENT FOR SPEECH AUDIOMETRY

## 1 Scope

This Recommendation deals with audiometers designed to provide a means of presenting speech sounds to a subject in a standardized manner, e.g. for the measurement of speech recognition. The Recommendation is consistent with the requirements of the IEC Publication 645-2: *Audiometers - Part 2: Equipment for speech audiometry*, 1993 edition. It contains an appropriate test scheme for pattern evaluation and verification.

Note: To avoid duplication, IEC 645-2 makes reference to IEC 645-1: *Audiometers - Part 1: Pure-Tone Audiometers*, 1992 edition, where common elements are concerned.

## 2 Construction and maximum permissible errors

2.1 Speech audiometers that are submitted to the control of legal metrology services shall comply with the requirements formulated in the IEC Publication 645-2, 1993 edition, in which speech audiometers having various minimum mandatory facilities, are referred to as types A and B. The errors of speech audiometers shall be within the maximum errors specified in that Publication and which are to be considered as the maximum permissible errors on pattern evaluation and initial and subsequent verifications.

In a multi-function instrument (e.g. a pure-tone audiometer including facilities for performing speech audiometry) the requirements of this Recommendation refer only to the parts of the instrument related to speech audiometry.

2.2 Speech audiometers shall be tested using calibration devices according to the following IEC Publications:

- IEC 303: *IEC provisional reference coupler for the calibration of earphones used in audiometry*, 1970 edition;
- IEC 318: *An IEC artificial ear, of the wide band type, for the calibration of earphones used in audiometry*, 1970 edition;
- IEC 373: *Mechanical coupler for measurements on bone vibrators*, 1990 edition.

2.3 Speech test material used with these speech audiometers should be in accordance with the relevant requirements of IEC 645-2 and those of ISO/DIS 8253-3: *Acoustics - Audiometric test methods - Part 3: Speech audiometry*, 1993 edition.

2.4 When different values for maximum permissible errors in service and at verification are prescribed by national regulation, the maximum permissible errors in service shall be 1.25 times the values prescribed for verification.

2.5 The programming and operation of computer-controlled audiometers shall be such that the test results are consistent with those obtained with manual audiometers, using the audiometric test methods described in ISO 8253-3.

2.6 Audiogram forms that are provided as an integral part of an audiometer, shall be in accordance with the relevant requirements of ISO 8253-3.

Note: For audiograms displayed on a screen, this requirement may be only partly achievable.

2.7 The characteristics to be examined for pattern evaluation and verification are listed in Annex A.

### 3 Stability

The materials and the construction of speech audiometers, including the associated earphones, loudspeaker(s) and bone vibrator, shall be such as to ensure sufficient stability to enable the instrument to comply with the maximum permissible errors specified in clause 2 when it is set up in accordance with the manufacturer's instructions for normal use.

### 4 Inscriptions and markings

4.1 Speech audiometers shall bear, in a clear and indelible manner, the following markings:

- a) manufacturer's trade mark,
- b) pattern designation,
- c) type,
- d) serial number,
- e) pattern-approval sign in conformity with national regulations.

4.2 The earphones, loudspeaker(s) and bone vibrator and all other separate parts of the audiometer (e.g. CD-player) shall be unambiguously identifiable as associated with the main instrument.

4.3 Every speech audiometer shall be accompanied by an instruction manual which shall include all the information listed in sub-clause 17.2 of IEC 645-2.

The instruction manual shall additionally recommend that the user perform routine checks and subjective tests on the equipment in use to ensure as far as possible that the equipment is working correctly and that its calibration has not been altered noticeably. An example of procedures for such checking is given in Annex B. A suitable check list for these tests shall be provided with the instruction manual. The manual shall state that these checks should be performed regularly. Equipment that is used daily should be checked at least weekly. Equipment that is used only occasionally should be checked before each period during which it is used.

## 5 Marks

It shall be possible to protect, by means of seals or marks, the parts and components of speech audiometers accessible to the user and capable of influencing the instruments' performance characteristics.

A suitable place for the application of verification marks shall be provided.

ANNEX A  
(mandatory)

PATTERN EVALUATION AND VERIFICATION PROCEDURES  
FOR SPEECH AUDIOMETERS

The following test scheme specifies the procedures for pattern evaluation and for two stages of verification (stage 1: initial or basic verification, stage 2: periodic verification). It is recommended that stage 2 procedures be performed on the equipment in its normal working situation.

- Notes: 1) This scheme conforms with ISO 8253-3.  
2) It is recommended that the acoustic coupler, in accordance with IEC 303, be used for the calibration of Beyer DT48 and Telephonics TDH39 earphones, and that the artificial ear, in accordance with IEC 318, be used for the calibration of other supra-aural earphones.

A.1 Preferably five specimens of the same pattern should be submitted for pattern evaluation. If fewer than three specimens are tested, the acceptance for verification may be limited to two years so that further experience with the pattern may be gained.

The characteristics to be examined for pattern evaluation are listed in Table 1, column 2.

A.2 Basic verification (stage 1, referred to as stage C in ISO 8253-3) shall be performed on audiometers before their delivery to the user. They need not be employed routinely, but may be required when a serious equipment fault or error occurs or when, after a long period of time, it is suspected that the equipment may no longer be performing fully to specifications. It may, however, be advisable to submit equipment for a stage 1 verification after, for example, five years' use if it has not otherwise been subject to a test during that time.

The characteristics to be examined for the basic verification are listed in Table 1, column 3.

A.3 Periodic verification (stage 2, referred to as stage B in ISO 8253-3) should preferably be performed at intervals of three months, although other intervals between tests may be acceptable in the light of experience with a specific equipment in known conditions of use. The maximum interval between such verifications should, however, not exceed twelve months.

The characteristics to be examined for periodic verifications are given in Table 1, column 4.

Table 1  
 Characteristics to be examined for pattern evaluation and verification  
 of speech audiometers

Instrument characteristics (relevant clauses of IEC 645-1 (A) and IEC 645-2 (B) are given in brackets)	Pattern evaluation	Basic verification (stage 1)	Periodic verification (stage 2)
<b>I GENERAL CHARACTERISTICS</b>			
1 Electric safety (A 5.1)	x		
2 Talk-back system (B 15)	x	x	x
3 Warm-up time (A 5.3)	x		
4 Sensitivity to temperature and humidity (A 5.4.1, A 5.4.4, A 10.2 b)	x		
5 Supply voltage (A 5.4.2, A 5.4.3, A 5.4.4, A 10.2 b)	x		
6 Electrostatic and electromagnetic interference (A 5.4.5)	x		
7 Unwanted sounds (A 5.5 except A 5.5.3, B 12)	x	x	
8 External signal input (A 6.2, A 7.2)	x		
9 Signal level indicator (B 7)	x		
<b>II SIGNAL CHARACTERISTICS FOR EARPHONE, BONE VIBRATOR AND LOUDSPEAKER OUTPUT, IF PROVIDED</b>			
10 Level range (B 8.2)	x		
11 Audiometer frequency response (B 10.1)	x	x	x
12 Level accuracy (A 7.3, B 9)	x	x (at selected levels)	x
13 Level control (A 7.4, B 8)	x	x (at selected frequency)	
14 Harmonic distortion (B 11)	x	x (loudspeaker output may be tested in situ)	x
15 Interrupter switch (A 7.6, B 16)	x	x	
16 Microphone frequency response (B 10.2)	x	x	

Instrument characteristics (relevant clauses of IEC 645-1 (A) and IEC 645-2 (B) are given in brackets)	Pattern evaluation	Basic verification (stage 1)	Periodic verification (stage 2)
<b>III MASKING-NOISE CHARACTERISTICS</b>			
17 Level range (B 13.3)	x		
18 Frequency spectrum (B 13.1)	x	x	
19 Level accuracy (B 13.2)	x	x	x (at selected levels)
20 Level control (A 7.5.3 - 2nd paragraph only)	x	x	x (at selected frequency)
<b>IV TRANSDUCERS</b>			
21 Earphones (A 9.1, A 10.2 j)	x	x	x (head band force only)
22 Bone vibrator (A 9.2, A 10.2 d)	x	x	x (head band force only)
23 Monitor earphone or loudspeaker (B 14)	x	x	

It is recommended that, to some extent, routine checking and, especially, subjective listening tests be performed prior to pattern evaluation and verification testing. A recommended procedure in accordance with ISO 8253-3, which may be partly or fully applied as appropriate, is given in Annex B.

ANNEX B  
(informative)

**RECOMMENDED PROCEDURES  
FOR ROUTINE CHECKS AND SUBJECTIVE TESTS  
TO BE PERFORMED BY THE USER OF SPEECH AUDIOMETERS  
AND TO BE PARTLY OR FULLY INCLUDED  
IN PATTERN EVALUATION AND VERIFICATION TESTS AS APPROPRIATE**

The recommended procedures for routine checks and subjective tests, referred to as stage A in ISO/DIS 8253-3, are all simple tests which do not require the use of measuring instruments.

The most important elements are the subjective tests given in B.4 to B.7. These tests can only be successfully performed by an operator with an unimpaired and preferably very good hearing.

The ambient noise conditions during the tests shall be comparable to those present when the equipment is in use.

Note: The checking procedures described in B.1 to B.8 should be carried out with the audiometer set up in its usual working situation. If a booth or separate test room is used, the equipment should be checked as installed; an assistant may be required in order to carry out the procedures. The checks shall then include the inter-connections between the audiometer and the equipment in the booth, but the additional connecting leads and any plug and socket connections at the junction box should be examined, as well as potential sources of intermittency or incorrect connection.

- B.1 Examine and clean as appropriate the equipment and all accessories. Check earphone cushions, plugs and leads for signs of wear and damage. Damaged or badly worn leads shall be replaced.
  
- B.2 Switch on equipment and leave on for recommended warm-up time or at least five minutes, whichever is greater. Carry out any setting-up procedures as specified by the manufacturer. Ensure that transducer and instrument serial numbers or other identifying marks correspond correctly to each other.
  
- B.3 If sound field testing is being undertaken, ensure that the reference point is at the correct position and clearly identified.
  
- B.4 Check that the audiometer output is approximately correct and ambient noise levels are typical and acceptable by having a person listen to low level speech test signals. The same person should preferably be used each time the test is performed and shall have well-known hearing threshold levels within the normal range. The test shall be performed with all appropriate output transducers.

B.5 Listen to the speech test material at a higher level (e.g. a hearing level of 60 to 70 dB on air conduction and of 40 to 50 dB on bone conduction) at all appropriate functions and using a representative sample of the test signals available. Listen for proper functioning, in particular absence of distortion and freedom from interfering noise.

B.6 Listen at low levels and ensure that no sign of hum or noise or any other unwanted sound from the equipment is audible at the test subject's position.

B.7 Check that attenuators do indeed attenuate the signals over their full range.

B.8 Ensure that the subject's talk-back system and the monitor circuits operate correctly.

