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ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 389

STANDARD REFERENCE ZERO FOR THE CALIBRATION OF PURE-TONE AUDIOMETERS

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BRIEF HISTORY

The ISO Recommendation R 389, *Standard Reference Zero for the Calibration of Pure-tone Audiometers*, was drawn up by Technical Committee ISO/TC 43, *Acoustics*, the Secretariat of which is held by the British Standards Institution (BSI).

Work on this question by the Technical Committee began in 1955 and led, in 1962, to the adoption of a Draft ISO Recommendation.

In January 1963, this Draft ISO Recommendation (No. 554) was circulated to all the ISO Member Bodies for enquiry. It was approved by the following Member Bodies:

Australia	Germany	Republic of South Africa
Austria	Hungary	Romania
Belgium	India	Sweden
Brazil	Italy	Switzerland
Chile	Japan	United Kingdom
Czechoslovakia	Netherlands	U.S.A.
Denmark	Norway	U.S.S.R.
Finland	Poland	Yugoslavia
France	Portugal	

No Member Body opposed the approval of the Draft.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in November 1964, to accept it as an ISO RECOMMENDATION.

FOREWORD

The need has frequently been expressed, both by otologists and audiologists and the makers of audiometers, for an internationally accepted basis of calibration for pure-tone audiometers of the types commonly employed for diagnostic or screening purposes.

This ISO Recommendation specifies a standard reference zero for the scale of hearing threshold level applicable to pure-tone audiometers, which it is hoped will help to promote agreement and uniformity in the expression of hearing threshold level measurements throughout the world.

This ISO Recommendation states the information in a form suitable for direct application to the calibration of audiometers, that is, in terms of the response of certain standard types of earphone measured on an artificial ear or coupler of stated type. The earphone-coupler combinations correspond with those currently used in a number of standardizing laboratories.

This ISO Recommendation is based on an assessment of the information available from the various standardizing laboratories responsible for audiometric standards, and from scientific publications, up to the end of 1961. Some notes on the derivation and application of the recommended reference levels are given in Appendix A to this ISO Recommendation.

ISO Recommendation R 389 November 1964

STANDARD REFERENCE ZERO FOR THE CALIBRATION OF PURE-TONE AUDIOMETERS

1. EXPLANATION OF TERMS

For the purpose of this ISO Recommendation, the following terms are employed:

1.1 *Equivalent threshold sound pressure level (monaural earphone listening)*, of an ear at a specified frequency and for a specified type of earphone and for a stated force of application of the earphone to the human ear. Sound pressure level set up by the earphone at that frequency in a specified artificial ear or coupler when the earphone is actuated by that voltage which, with the earphone applied to the ear concerned, would correspond with the threshold of hearing.

1.2 *Reference equivalent threshold sound pressure level (monaural earphone listening)*, at a specified frequency, for a specified type of earphone and for a specified pattern of artificial ear. Modal value, at that frequency, of the equivalent threshold sound pressure levels of an adequately large number of ears of otologically normal subjects within the age limits of 18 to 30 years inclusive.

NOTE. — For the purpose of this ISO Recommendation, an " otologically normal subject " is understood to be a person in a normal state of health who is free from all signs or symptoms of ear disease and from wax in the ear canal, and has no history of undue exposure to noise.

2. SPECIFICATIONS

The reference equivalent threshold sound pressure level, for constant auditory threshold, is dependent on the pattern of earphone and on the pattern of artificial ear employed for its calibration. Usage in this respect may vary from one nation, or standardizing laboratory, to another.

The recommended standard values are given below in the Table, corresponding to the arrangements adopted by different standardizing laboratories, in so far as these have been reported to the International Organization for Standardization (ISO).

Table. — **Recommended Reference Equivalent Threshold Sound Pressure Levels**

Frequency	**Reference equivalent threshold sound pressure levels relative to 2×10^{-5} N/m² (2×10^{-4} dyn/cm²)**				
Hz (c/s)	decibels				
125	44.5	47.5	47	45.5	55
250	27.5	28.5	28	24.5	33
500	11.5	14.5	11.5	11	14.5
1000	5.5	8	5.5	6.5	8.5
1500	4.5	7.5	6.5	6.5	8.5
2000	4.5	8	9	8.5	9
3000	6	6	8	7.5	10.5
4000	8	5.5	9.5	9	11.5
6000	17	8	8	8	18.5
8000	14.5	14.5	10	9.5	9.5
Pattern of earphone	Audio 15	Beyer DT 48	S.T.C. 4026-A	W.E. 705-A	T.D.6
Type of artificial ear or coupler	C.N.E.T. artificial ear	N.B.S. type 9-A coupler (with P.T.B. adapter)	B.S.2042 (Fig. 1a, 2b) artificial ear	N.B.S. type 9-A coupler	IU-3 type artificial ear
Country of origin of data	France	Germany	United Kingdom	U.S.A.	U.S.S.R.