

BS EN 61094-8:2012

Incorporating corrigendum May 2013



BSI Standards Publication

Electroacoustics — Measurement microphones

Part 8: Methods for determining the
free-field sensitivity of working standard
microphones by comparison

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

raising standards worldwide™



National foreword

This British Standard is the UK implementation of EN 61094-8:2012 incorporating corrigendum 2013. It is identical to IEC 61094-8:2012.

The UK participation in its preparation was entrusted to Technical Committee EPL/29, Electroacoustics.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2013.
Published by BSI Standards Limited 2013

ISBN 978 0 580 82031 1

ICS 17.140.50

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2013.

Amendments/corrigenda issued since publication

Date	Text affected
31 May 2013	Implementation of CENELEC corrigendum January 2013: Standard title corrected

English version

**Electroacoustics -
Measurement microphones -
Part 8: Methods for determining the free-field sensitivity of working
standard microphones by comparison
(IEC 61094-8:2012)**

Electroacoustique -
Microphones de mesure -
Partie 8: Méthodes pour la détermination
de l'efficacité en champ libre par
comparaison des microphones étalons
de travail
(CEI 61094-8:2012)

Elektroakustik -
Messmikrofone -
Teil 8: Verfahren zur Ermittlung des
Freifeld-Übertragungskoeffizienten von
Gebrauchs-Normalmikrofonen nach der
Vergleichsmethode
(IEC 61094-8:2012)

This European Standard was approved by CENELEC on 2012-10-24. CENELEC 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 CEN-CENELEC Management Centre or to any CENELEC 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 CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

CENELEC

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 29/752/CDV, future edition 1 of IEC 61094-8, prepared by IEC/TC 29 "IEC TC 29, Electroacoustics" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61094-8:2012.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2013-07-24
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2015-10-24

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 61094-8:2012 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61094-1	-	Measurement microphones - Part 1: Specifications for laboratory standard microphones	EN 61094-1	-
IEC 61094-2	-	Electroacoustics - Measurement microphones - Part 2: Primary method for the pressure calibration of laboratory standard microphones by the reciprocity technique	EN 61094-2	-
IEC 61094-3	-	Measurement microphones - Part 3: Primary method for free-field calibration of laboratory standard microphones by the reciprocity technique	EN 61094-3	-
IEC 61094-4	-	Measurement microphones - Part 4: Specifications for working standard microphones	EN 61094-4	-
IEC 61094-5	-	Measurement microphones - Part 5: Methods for pressure calibration of working standard microphones by comparison	EN 61094-5	-
IEC 61094-6	-	Measurement microphones - Part 6: Electrostatic actuators for determination of frequency response	EN 61094-6	-
IEC/TS 61094-7	-	Measurement microphones - Part 7: Values for the difference between free-field and pressure sensitivity levels of laboratory standard microphones	-	-
ISO/IEC Guide 98-3	-	Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)	-	-
ISO 26101	-	Acoustics - Test methods for the qualification- of free-field environments	-	-

CONTENTS

1	Scope	6
2	Normative references	6
3	Terms and definitions	7
4	Reference environmental conditions	8
5	Principles of free-field calibration by comparison	8
5.1	General principle	8
5.2	General principles using sequential excitation	8
5.3	General principles using simultaneous excitation	8
6	General requirements	9
6.1	The test space	9
6.2	Methods of establishing the free-field	9
6.2.1	General	9
6.2.2	Using a test space with sound absorbing surfaces	9
6.2.3	Time selective methods for obtaining the free-field sensitivity	10
6.3	The sound source	10
6.4	Reference microphone	11
6.5	Monitor microphone	12
6.6	Test signals	12
6.7	Configuration for the reference microphone and microphone under test	13
7	Factors influencing the free-field sensitivity	13
7.1	General	13
7.2	Polarizing voltage	13
7.3	Acoustic centre of the microphone	13
7.4	Angle of incidence and alignment with the sound source	14
7.5	Mounting configuration	14
7.6	Dependence on environmental conditions	14
8	Calibration uncertainty components	14
8.1	General	14
8.2	Sensitivity of the reference microphone	15
8.3	Measurement of the microphone output	15
8.4	Differences between the sound pressure applied to the reference microphone and to the microphone under test	15
8.5	Influence of indirect sound	15
8.6	Influence of signal processing	16
8.7	Influence of microphone characteristics and measurement system performance	16
8.7.1	Microphone capacitance	16
8.7.2	Measurement system non-linearity	16
8.7.3	Validation of calibration system	16
8.8	Uncertainty on free-field sensitivity level	16
	Annex A (informative) Basic substitution calibration in a free-field chamber	18
	Annex B (informative) Time selective techniques	22
	Bibliography	30

Figure A.1 – Illustration of source and receiver setup in a free-field room, where the monitor microphone has been integrated into the loudspeaker	18
Figure A.2 – Practical implementation in a hemi-anechoic room with a source flush-mounted in the floor	19
Figure A.3 – Examples of loudspeaker sources	21
Figure B.1 – Illustration of set-up for measurement with time selective techniques.....	23
Table 1 – Calibration options for the reference microphone and associated typical measurement uncertainty.....	12
Table 2 – Typical uncertainty components	17

MEASUREMENT MICROPHONES –

Part 8: Methods for determining the free-field sensitivity of working standard microphones by comparison

1 Scope

This part of the IEC 61094 series is applicable to working standard microphones meeting the requirements of IEC 61094-4. It describes methods of determining the free-field sensitivity by comparison with a laboratory standard microphone or working standard microphone (where applicable) that has been calibrated according to either:

- IEC 61094-3,
- IEC 61094-2 or IEC 61094-5, and where factors given in IEC/TS 61094-7 have been applied,
- IEC 61094-6,
- this part of IEC 61094.

Methods performed in an acoustical environment that is a good approximation to an ideal free-field (e.g. a high quality free-field chamber), and methods that use post processing of results to minimise the effect of imperfections in the acoustical environment, to simulate free-field conditions, are both covered by this part of IEC 61094. Comparison methods based on the principles described in IEC 61094-3 are also possible but beyond the scope of this part of IEC 61094.

NOTE 1 This part of IEC 61094 is also applicable to laboratory standard microphones meeting the requirements of IEC 61094-1, noting that these microphones also meet the electroacoustic specifications for working standard microphones.

NOTE 2 This part of IEC 61094 is also applicable to combinations of microphone and preamplifier where the determined sensitivity is referred to the unloaded output voltage of the preamplifier.

NOTE 3 Other devices, for example, sound level meters can be calibrated using the principles of this part of IEC 61094, but are not within the scope of this standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61094-1, *Measurement microphones – Part 1: Specifications for laboratory standard microphones*

IEC 61094-2, *Electroacoustics – Measurement microphones – Part 2: Primary method for pressure calibration of laboratory standard microphones by the reciprocity technique*

IEC 61094-3, *Measurement microphones – Part 3: Primary method for free-field calibration of laboratory standard microphones by the reciprocity technique*

IEC 61094-4, *Measurement microphones – Part 4: Specifications for working standard microphones*