

ANSI S1.15-1997/Part 1

---

---

AMERICAN NATIONAL STANDARD  
**MEASUREMENT MICROPHONES —  
PART 1: SPECIFICATIONS FOR  
LABORATORY STANDARD  
MICROPHONES**

---

---

ANSI S1.15-1997/Part 1

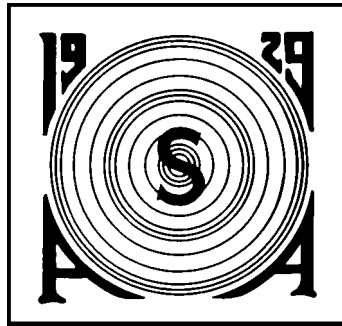
Accredited Standards Committee S1, Acoustics

---

Standards Secretariat  
Acoustical Society of America  
120 Wall Street, 32nd Floor  
New York, New York 10005-3993

The American National Standards Institute, Inc. (ANSI) is the national coordinator of voluntary standards development and the clearing house in the U.S. for information on national and international standards.

The Acoustical Society of America (ASA) is an organization of scientists and engineers formed in 1929 to increase and diffuse the knowledge of acoustics and to promote its practical applications.



**ANSI S1.15-1997/Part 1**

American National Standard  
**Measurement Microphones —  
Part 1: Specifications for Laboratory  
Standard Microphones**

Secretariat  
**Acoustical Society of America**

Approved 6 June 1997  
**American National Standards Institute, Inc.**

**Abstract**

This Standard specifies mechanical dimensions and certain electroacoustical characteristics for capacitor (condenser) microphones used as laboratory standards for sound pressure measurements of the highest attainable accuracy. The specifications are intended to ensure that primary calibration by the reciprocity method can be readily carried out. This Standard establishes a system to classify laboratory standard microphones into a number of types according to their dimensions and properties. This American National Standard is comparable to International Standard IEC 61094-1:1992, "Measurement microphones — Part 1: Specifications for laboratory standard microphones."

## AMERICAN NATIONAL STANDARDS ON ACOUSTICS

The Acoustical Society of America (ASA) provides the Secretariat for Accredited Standards Committees S1 on Acoustics, S2 on Mechanical Vibration and Shock, S3 on Bioacoustics, and S12 on Noise. These committees have wide representation from the technical community (manufacturers, consumers, and general-interest representatives). The standards are published by the Acoustical Society of America through the American Institute of Physics as American National Standards after approval by their respective standards committees and the American National Standards Institute.

These standards are developed and published as a public service to provide standards useful to the public, industry, and consumers, and to Federal, State, and local governments.

Each of the Accredited Standards Committees [operating in accordance with procedures approved by American National Standards Institute (ANSI)] is responsible for developing, voting upon, and maintaining or revising its own standards. The ASA Standards Secretariat administers committee organization and activity and provides liaison between the Accredited Standards Committees and ANSI. After the standards have been produced and adopted by the Accredited Standards Committees, and approved as American National Standards by ANSI, the ASA Standards Secretariat arranges for their publication and distribution.

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered and that a concerted effort be made towards their resolution.

The use of American National Standards is completely voluntary. Their existence does not in any respect preclude anyone, whether he or she has approved the standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this Standard.



Standards Secretariat  
Acoustical Society of America  
120 Wall Street, 32nd Floor  
New York, New York 10005-3993

Telephone: +1 212 248 0373  
Telefax: +1 212 248 0146  
E-mail: [asastds@aip.org](mailto:asastds@aip.org)

© 1998 by the Acoustical Society of America. This Standard may not be reproduced in whole or in part in any form for sale, promotion, or any commercial purpose, or any purpose not falling within the provisions of the Copyright Act of 1976, without prior written permission of the publisher. For permission, address a request to the Standards Secretariat of the Acoustical Society of America.

## Contents

	Page
Foreword .....	ii
1 Scope .....	1
2 Normative references .....	1
3 Definitions .....	1
4 Reference environmental conditions .....	3
5 Classification of laboratory standard microphones .....	3
6 Characteristics of laboratory standard microphones .....	4
7 Specifications .....	5

### Tables

1 Nominal mechanical dimensions and tolerance limits for the laboratory standard microphones of figure 1; dimensions in millimetres .....	6
2 Nominal mechanical dimensions and tolerance limits for the ground-shield reference configuration of figure 2; dimensions in millimetres .....	7
3 Electroacoustical specifications for laboratory standard microphones .....	8

### Figures

1 Mechanical configurations of microphones .....	6
2 Mechanical attachment to a microphone showing the ground-shield reference configuration .....	7

## Foreword

[This Foreword is for information only and is not an integral part of American National Standard Measurement Microphones — *Part 1: Specifications for Laboratory Standard Microphones*, ANSI S1.15-1997/Part 1.]

This American National Standard is comparable to International Standard IEC 61094-1:1992, "Measurement microphones — *Part 1: Specifications for laboratory standard microphones.*"

This Standard is *Part 1* of a series of standards related to measurement microphones.

*Part 2* of this series covers the primary method for pressure calibration of laboratory standard microphones by the reciprocity technique. *Part 3* covers the primary method for free-field calibration of laboratory standard microphones by the reciprocity technique. *Part 4* provides specifications for working standard microphones.

This Standard was developed under the jurisdiction of Accredited Standards Committee S1, Acoustics, which has the following scope:

*Standards, specifications, methods of measurement and test, and terminology, in the fields of physical acoustics including architectural acoustics, electroacoustics, sonics and ultrasonics, and underwater sound, but excluding those aspects which pertain to safety, tolerance, and comfort.*

At the time this standard was submitted to Accredited Standards Committee S1, Acoustics, for final approval, the membership was as follows:

J. P. Seiler, *Chairman*  
G. S. K. Wong, *Vice Chairman*  
A. Brenig, *Secretary*

<b>Acoustical Society of America</b> .....	J. P. Seiler G. S. K. Wong ( <i>Alt.</i> )
<b>Air-Conditioning and Refrigeration Institute (ARI)</b> .....	R. Comparin S. Sanders ( <i>Alt.</i> )
<b>American Industrial Hygiene Association (AIHA)</b> .....	L. H. Royster J. F. Meagher ( <i>Alt.</i> )
<b>AT&amp;T</b> .....	M. S. Mayer R. M. Sachs ( <i>Alt.</i> )
<b>Audio Engineering Society, Inc.</b> .....	L. W. Sepmeyer M. R. Chial ( <i>Alt.</i> )
<b>Bruel &amp; Kjær Instruments</b> .....	L. J. Pace M. Alexander ( <i>Alt.</i> )
<b>Information Technology Industry Council (ITIC)</b> .....	R. Lotz W. F. Hanrahan ( <i>Alt.</i> )
<b>Larson-Davis Instrumentation Systems</b> .....	R. J. Peppin R. C. Chanaud ( <i>Alt.</i> )
<b>National Council of Acoustical Consultants</b> .....	B. E. Walker G. L. Augspurger ( <i>Alt.</i> )

<b>National Institute of Standards and Technology (NIST)</b> .....	V. Nedzelnitsky D. J. Evans ( <i>Alt.</i> )
<b>Sonetronics, Inc.</b> .....	R. T. Linderoth
<b>U.S. Air Force</b> .....	R. L. McKinley
<b>U.S. Army Aeromedical Research Laboratory</b> .....	B. Mozo
<b>U.S. Army Communications-Electronics Command</b> .....	T. Y. Fung
<b>U.S. Army Construction Engineering Research Laboratories (USA-CERL)</b> .....	P. D. Schomer M. White ( <i>Alt.</i> )
<b>U.S. Army Human Engineering Laboratory</b> .....	J. Kalb G. Garinther ( <i>Alt.</i> )
<b>U.S. Army Primary Standards Laboratory (APSL) of the U.S. Army TMDE Support Group</b> .....	J. R. Arrington

Individual Experts of Accredited Standards Committee S1, Acoustics, were:

J. R. Bareham	R. M. Guernsey	A. H. Marsh
S. L. Ehrlich	D. L. Johnson	L. W. Sepmeyer
K. M. Eldred	T. J. Kuemmel	H. E. von Gierke
W. J. Galloway	W. W. Lang	G. S. K. Wong
E. E. Gross, Jr.	G. C. Maling, Jr.	R. W. Young

Working Group S1/WG1, Standard Microphones and their Calibration, of Accredited Standards Committee S1 provided comments and recommendations during the development of the IEC 61094 series of International Standards for measurement microphones. The composition of S1/WG1 was:

V. Nedzelnitsky, Chair

J. R. Arrington	D. J. Evans	E. E. Gross
E. D. Burnett	E. Frederiksen	G. S. K. Wong

The *ad hoc* Working Group, that assisted Accredited Standards Committee S1, Acoustics, in the preparation of this Standard, had the following membership:

A. H. Marsh	V. Nedzelnitsky	P. D. Schomer	G. S. K. Wong
-------------	-----------------	---------------	---------------

Suggestions for improvement of this Standard will be welcomed. They should be made in writing to Accredited Standards Committee S1, Acoustics, in care of the ASA Standards Secretariat, 120 Wall Street, 32nd floor, New York, New York 10005-3993, USA. Telephone +1 212 248 0373; FAX: +1 212 248 0146, E-mail asastds@aip.org.

## American National Standard

# Measurement Microphones—Part 1: Specifications for Laboratory Standard Microphones

## 1 Scope

This Part 1:

— specifies mechanical dimensions and certain electroacoustic characteristics for condenser microphones used as laboratory standards for sound pressure measurements of the highest attainable accuracy. The specifications are intended to ensure that primary calibration by the reciprocity method can be readily carried out for the purpose of traceability to national standards.

— establishes a system for classifying laboratory standard condenser microphones into a number of types according to their dimensions and properties in order to facilitate the specification of calibration methods, the conduct of inter-laboratory comparisons involving the calibration of the same microphones in different laboratories, and the interchangeability of microphones in a given calibration system.

## 2 Normative references

The following Standards contain provisions that, through reference in this text, constitute provisions of this American National Standard. At the time of approval by the American National Standards Institute, Inc. (ANSI), the editions indicated were valid. All standards are subject to revision. Parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the Standards listed below. Information on the most recent editions is available from the ASA Standards Secretariat.

[1] ANSI S1.1-1994, *American National Standard Acoustical Terminology*.

[2] IEC 50(801): 1994, *International Electrotechnical Vocabulary—Chapter 801: Acoustics and electroacoustics*. First edition.

[3] ASME B1.1:1989, *Unified inch screw threads (UN and UNR thread form)*.

## 3 Definitions

For the purposes of this Part 1, the following definitions apply. Definitions for related quantities are given in ANSI S1.1 and in IEC 50(801). Boldface symbols represent complex quantities.

**3.1 capacitor (condenser) microphone.** Microphone that consists of a capacitor and whose operation depends upon interaction between its electric field and the change of its electrostatic capacitance when exposed to the pressure of a sound wave [8.25 of ANSI S1.1-1994 and IEC 801-06-13].

NOTE – This Standard only considers capacitor (condenser) microphones operating by a virtually constant charge obtained from an external polarizing voltage applied from a source of suitably high internal resistance.

**3.2 laboratory standard microphone.** Capacitor microphone capable of being calibrated to a very high accuracy by a primary method such as the closed coupler reciprocity method, and meeting certain severe requirements on mechanical dimensions and electroacoustical characteristics, especially with respect to stability in time and dependence on environmental conditions.

**3.3 open-circuit voltage.** Alternating voltage appearing at the electrical output terminals of a microphone as measured by the insert voltage technique when the microphone is attached to the ground-shield configuration specified in 7.2, but is otherwise unloaded. Unit, volt (V).

NOTE – Owing to the capacitive nature of the microphone, the voltage at the electrical terminals depends on the electrical load presented by the mechanical and electrical attachment of the microphone to a preamplifier. For this reason, preamplifiers used for measuring the open-circuit voltage of a microphone should fulfill the requirements of 7.2.

**3.4 pressure sensitivity of a microphone.** For a sinusoidal signal of given frequency and for given environmental conditions, quotient of the root-mean-square, open-circuit voltage of the microphone by the root-mean-square sound pressure acting over the exposed surface of the diaphragm (i.e., at the acoustical terminals of the