

**ANSI S2.46-1989
(ASA 82-1989)**

Reaffirmed by ANSI
July 10, 2001

Reaffirmed by ANSI
May 24, 2005

Reaffirmed by ANSI
April 22, 2010

**AMERICAN NATIONAL STANDARD
Characteristics to be Specified for Seismic Transducers**

**Accredited Standards Committee S2, Mechanical Shock
and Vibration**

ABSTRACT

This standard specifies the characteristics of a seismic transducer (pickup) which can serve as an adequate description of the capabilities of the pickup to perform a shock or vibration measurement in various environments. It is intended as a guide to instrument manufacturers for indicating the characteristics of their transducers that are critical in specifying, selecting, or preparing performance description by users. This standard is the national counterpart of ISO 8042-1988 Shock and Vibration Measurements—Characteristics to be Specified for Seismic Pick-Ups.

AMERICAN NATIONAL STANDARDS ON ACOUSTICS

The Acoustical Society of America provides the Secretariat for Accredited Standards Committees S1 on Acoustics, S2 on Mechanical Shock and Vibration, 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.

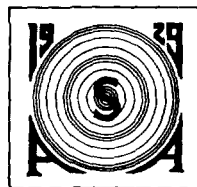
This standard was approved by the American National Standards Institute as ANSI S2.46-1989 on 5 June 1989.

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. An American National Standard is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an American National Standard does not in any respect preclude anyone, whether he has approved the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standard. American National Standards are subject to periodic review and users are cautioned to obtain the latest editions.

Caution Notice: An American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of publication.

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.



Published by the Acoustical Society of America through the American Institute of Physics

Copyright © 1989 by the Acoustical Society of America. No portion of this publication may be quoted or reproduced in any form without permission of the Acoustical Society of America.

Any request to reproduce this standard in whole or in part should be addressed to the Standards Secretariat, in care of the Acoustical Society of America, 335 East 45th Street, New York, New York 10017-3483

FOREWORD

[This Foreword is not a part of American National Standard Guide to the Characteristics to be Specified for Seismic Transducers ANSI S2.46-1989 (ASA Catalog No. 82-1989).]

This standard was developed under the jurisdiction of Accredited Standards Committee S2, Mechanical Shock and Vibration, using the American National Standards Institute (ANSI) Accredited Standards Committee Procedure. The Acoustical Society of America provides the Secretariat for Accredited Standards Committee S2, Mechanical Shock and Vibration. This standard is the national counterpart of ISO 8042-1988 Shock and Vibration Measurements—Characteristics to be Specified for Seismic Pick-Ups.

Accredited Standards Committee S2, Mechanical Shock and Vibration, under whose jurisdiction this standard was developed, has the following scope:

Standards, specifications, methods of measurement and test, and terminology, in the fields of mechanical shock and vibration, but excluding those aspects which pertain to biological safety, tolerance, and comfort.

At the time this standard was submitted to Accredited Standards Committee S2, Mechanical Shock and Vibration, for approval, the membership was as follows:

S. I. Hayek, *Chairman*
M. R. Serbyn, *Vice-Chairman*
A. Brenig, *Secretary*

Acoustical Society of America ● S. I. Hayek, M. R. Serbyn (*A/I*)
Institute of Environmental Sciences ● R. Brown, J. Ehmann (*A/I*)
National Institute of Standards and Technology ● M. R. Serbyn, D. C. Robinson (*A/I*)
National Electrical Manufacturers Association ● D. V. Wright, E. LaBrush (*A/I*)
David Taylor Research Center ● A. Kilcullen
Schenck Trebel Corporation ● D. G. Stadelbauer
U.S. Department of the Air Force ● O. Maurer, J. P. Henderson (*A/I*)
U.S. Department of the Navy, Naval Sea Systems Command ● P. Majumdar, D. D. Bernhard (*A/I*)

Individual experts of Accredited Standards Committee S2, Mechanical Shock and Vibration, were:

P. K. Baade	R. Eshleman	A. O. Sykes
R. G. Bartheld	S. Feldman	H. E. von Gierke
L. Batchelder	D. Johnson	D. Walker
G. Booth	P. H. Maedel, Jr.	S. P. Ying
J. Catlin	D. Muster	
K. M. Eldred	H. L. Rich	

Working Group S2-81, Use and Calibration of Vibration and Shock Measuring Instruments, which assisted the Accredited Standards Committee S2, Mechanical Shock and Vibration, in the development of this standard, had the following membership:

B. E. Douglas, *Chairman*

C. Andrews	J. Heist	P. H. Maedel, Jr.
D. E. Bently	L. Herstein	R. Peppin
D. Bernhard	R. Lally	M. R. Serbyn
J. Carey	G. F. Lang	A. Sykes
E. Edwards	P. Lederer	
R. L. Eshleman	Y. Luk	

Suggestions for improvements in this standard will be welcomed. They should be sent to **Accredited Standards Committee S2 at the Standards Secretariat, in care of the Acoustical Society of America, 335 East 45th Street, New York, NY 10017-3483. Telephone (212) 661-9404.**

CONTENTS

1 SCOPE AND FIELD OF APPLICATION	1
2 REFERENCES	1
3 DEFINITIONS	1
4 GENERAL INFORMATION	1
4.1 General.....	1
4.2 Type.....	1
4.3 Type of Motion.....	1
4.4 Sensing Element.....	1
4.5 Orientation	1
4.6 Indication of Sensitive Direction.....	1
4.7 Overall Dimensions	1
4.8 Material.....	2
4.9 Attachment.....	2
4.10 Mounting.....	2
4.11 Mass and Moment of Inertia.....	2
4.12 Position of Sensing Element	2
4.13 Connections.....	2
4.14 Energy Source.....	2
4.15 Nature of Output	2
4.16 Auxiliary Equipment.....	2
5 CHARACTERISTICS	2
5.1 Measurement Range	2
5.2 Sensitivity	3
5.3 Frequency Range	3
5.4 Phase Response.....	3
5.5 Damping.....	3
5.6 Transverse Sensitivity.....	3
5.7 Limits for Maximum Motion without Damage.....	3
5.8 Linearity and Hysteresis.....	4
5.9 Electrical Impedance.....	4
6 ENVIRONMENTAL EFFECTS	4
6.1 Temperature and Humidity Effects.....	4
6.2 Thermal Transients.....	4
6.3 Disturbing Acoustic Fields.....	4
6.4 Disturbing Electromagnetic Fields.....	4
6.5 Earth Currents.....	4
6.6 Base-Strain Sensitivity	4
6.7 Radiation Exposure	4
 TABLE	
TABLE 1 Appropriate units for measured quantities	3

American National Standard

Characteristics to be Specified for Seismic Transducers

1 SCOPE AND FIELD OF APPLICATION

This standard specifies rules for the presentation of important characteristics for electro-mechanical shock and vibration transducers (seismic pickups), the electrical outputs of which are known functions of the uniaxial, multiaxial, or angular accelerations, velocities, or displacements of objects the motions of which are being measured.

It is intended as a guide to instrument manufacturers for indicating characteristics of their transducers and as a help to users in selecting a particular type of transducer or preparing performance specifications. The intention is to ensure that the user receives an adequate description of the characteristics of any particular transducer.

Throughout this standard, shock and vibration transducers will be referred to simply as "transducers."

2 REFERENCES

- (1) International Organization for Standardization, *Vibration and Shock Vocabulary*, ISO 2041-1975.
- (2) ANSI S2.61-1989, *Guide to the Mechanical Mounting of Accelerometers*.

3 DEFINITIONS

For the purposes of this ANSI standard, the definitions given in ISO 2041-1975 and ISO 5347/0-1987 *Method for the Calibration of Vibration and Shock Pick-Ups—Part 0: Basic Concepts* are applicable.

4 GENERAL INFORMATION

4.1 General

The information specified in Sections 4.2 to 6.8 is considered basic to the user of transducers. Therefore, it is recommended that the manufacturer provide this information, in full or in part, with the literature supplied with the transducer.

4.2 Type

The manufacturer shall state whether the output of the transducer is proportional to the displacement, velocity, or acceleration of the vibration or shock input.

4.3 Type of Motion

The manufacturer shall indicate the nature of the motion to which the transducer will respond, such as

- (a) uniaxial,
- (b) multiaxial,
- (c) angular.

4.4 Sensing Element

The type of sensing element shall be indicated, for example, as follows:

- (a) strain-sensitive resistance wire, bonded or unbonded,
- (b) resistive potentiometer,
- (c) variable capacitance,
- (d) variable inductance,
- (e) differential transformer,
- (f) electromagnetic element,
- (g) piezoelectric element,
- (h) electronic tube,
- (i) photoelectric element,
- (j) electrokinetic element,
- (k) piezoresistive element,
- (l) optical element,
- (m) magnetostrictive,
- (n) silicon chip.

4.5 Orientation

The suitability of the transducer for use in vertical, horizontal, and inverted mounting positions shall be stated.

4.6 Indication of Sensitive Direction

The sensitive direction of the transducer shall be indicated, e.g., by an arrow. If practical, the positive direction shall be marked or indicated by the orientation of an arrow, and the polarity of output for motion in the positive direction shall be described.

4.7 Overall Dimensions

Overall outline dimensions of the transducer shall be given in a diagram.