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AMERICAN NATIONAL STANDARD
Guide to the Mechanical Mounting of Accelerometers

Accredited Standards Committee S2, Mechanical Shock and Vibration

ABSTRACT

This standard specifies methods for mounting contact accelerometers and delineates the limitations of the recommended methods such as frequency range of interest, amplitude, and phase measurement accuracy. Characteristics of the mounting arrangements used by specific accelerometers which should be specified by the manufacturer are established and guidance is provided to the user to optimize performance of a recommended mounting method.

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 S2.61-1989 on 7 February 1989.

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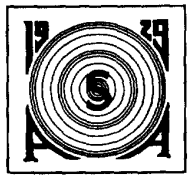
The Acoustical Society of America (ASA) is an organization of scientists and engineers formed in 1929 to increase and diffuse the knowledge of acoustics and to promote its practical applications.



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FOREWORD

[This Foreword is not a part of American National Standard Guide to the Mechanical Mounting of Accelerometers, ANSI S2.61-1989 (ASA Catalog No. 78-1989).]

This standard is the counterpart of ISO 5348-1987 Mechanical Vibration and Shock—Mechanical Mounting of Accelerometers, developed by ISO/TC 108/SC3 Use and Calibration of Vibration and Shock Measuring Instruments, under the International Organization for Standardization (ISO).

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.

Accredited Standards Committee S2, Mechanical Shock and Vibration, under whose jurisdication 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 final approval, the membership was as follows:

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

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

P. K. Baade
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D. Walker
S. P. Ying

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*

D. E. Bently
R. R. Bouche
W. F. Caplan
J. B. Catlin
E. Edwards
R. L. Eshleman
J. Heist
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G. F. Lang
M. R. Serbyn

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.

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0 INTRODUCTION

Vibration measurement transducers fall into two broad classes: contacting and noncontacting. Noncontacting structural response transducers are placed in close proximity to the structure and include such generic types as eddy current probes and optical proximity probes. Contacting transducers are placed in mechanical contact with the structural system and include such generic types as piezoelectric and piezoresistive accelerometers and seismic velocity transducers. This standard is concerned with contacting type accelerometers, which enjoy wide current popularity. A major concern with using such transducers is that the mechanical connection between the accelerometer and test structure will alter the response of the structure. This standard discusses methods of mounting accelerometers to a structure and parameters that control the accuracy of structural measurement using contact accelerometers.

1 SCOPE AND FIELD OF APPLICATION

This ANSI standard describes the mounting characteristics of accelerometers to be specified by the manufacturer and makes recommendations to the user for mounting accelerometers. The application of this standard is limited to the mounting of electromechanical transducers of the type that are attached on the surface of the structure in motion. It does not cover other types, such as relative motion pickups. This standard is in general accordance with ISO 5348-1987 Mechanical Vibration and Shock—Mechanical Mounting of Accelerometers.

2 REFERENCES

(1) International Organization for Standardization, Vibration and Shock Vocabulary, ISO 2041-1975.

(2) ISO 2954-1975 Mechanical Vibration of Rotating and Reciprocating Machinery—Requirements for Instruments for Measuring Vibration Severity.

(3) ISO 5347-1987 Methods of Calibration of Vibration and Shock Pickups.

(4) ISO/DP 7626/Part 1-1986 Methods for the Experimental Determination of Mechanical Mobility, Part 1, Basic Definitions and Transducers.

(5) B. E. Douglas, "Model Damping Determinations from Resonance Spectral Shape Measurements," J. Acoust. Soc. Am. Suppl. 1 **58**, S24 (1975).

(6) ISO/DP 7626/Part 2, Methods for the Experimental Determination of Mechanical Mobility, Part 2.

(7) ISO/DP 7626/Part 3, Methods for the Experimental Determination of Mechanical Mobility, Part 3.

3 DEFINITIONS

For the purpose of this ANSI standard, the terms used and definitions given in ISO 2041-1975 are applicable.

4 SELECTION OF A MOUNTING METHOD

4.1 General Considerations

A contact accelerometer will achieve optimal performance only under the following conditions:

(a) The accelerometer follows as nearly as possible the motion of the structure under test at the accelerometer attachment.
(b) The motion of the structure shall not be measurably affected by the addition of the accelerometer.
(c) The effective (i.e., dynamic) mass of the accelerometer and mounting fixtures shall be small in comparison with the structure under test (see ISO 2954 and ISO/DP 7626/Part 1).

In order to achieve these conditions:
(a) the accelerometer and its mounting shall be as rigid as practical (the mounting surfaces shall be as clean and flat as practical);
(b) the mounting shall not introduce significant distorting motions of its own (note: This can best be achieved using simple symmetrical mountings); and
(c) the mass of the accelerometer and mounting shall be small in comparison with the structure under test (see ISO 2954).

4.2 Areas of Application

The selection of a mounting method is strongly dependent on the requirements of the measurement (i.e., frequency range of interest, phase accuracy, measurement, environment, etc.). Screw or stud mounting and cementing methods are the preferred methods in that the mounted resonance frequency is high and associat-