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AMERICAN NATIONAL STANDARD

Method for Specifying the Characteristics of Auxiliary Analog Equipment for Shock and Vibration Measurements

ANSI/ASA S2.4-1976

Accredited Standards Committee S2, Mechanical Vibration and Shock

Standards Secretariat
Acoustical Society of America
1305 Walt Whitman Road, Suite 300
Melville, NY 11747

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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.

ASA STD 8-1976 (ANSI S2.4-1976,
a revision of ANSI S2.4-1960)

ACOUSTICAL SOCIETY OF AMERICA STANDARD
Method for Specifying the Characteristics of Auxiliary Analog Equipment for Shock and Vibration Measurements

Standards Secretariat
Acoustical Society of America
335 East 45th Street
New York, New York 10017

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AMERICAN NATIONAL STANDARDS ON ACOUSTICS

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

These standards are developed 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 S2.4-1976 (a revision of ANSI S2.4-1960) on 4 August 1976 and reaffirmed by ANSI in 1982.

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. An American National Standard is intended as 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.

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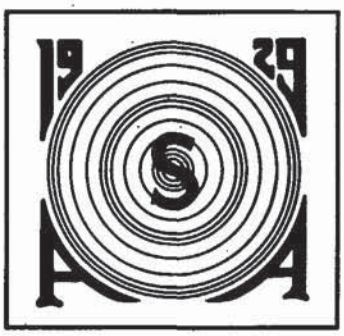

Second Printing, June 1983

FOREWORD

[This foreword is not a part of Acoustical Society of America Standard Method for Specifying the Characteristics of Auxiliary Equipment for Shock and Vibration Measurements, ASA STD 8-1976 (ANSI S2.4-1976, a revision of ANSI S2.4-1960).]

This American National Standard provides suggestions on subject matter and format for describing auxiliary equipment for mechanical shock and vibration measurements, so there will be a clear understanding by both the user and the manufacturer. It is intended to outline, in standardized form, what data should be presented to enable the person experienced in making such measurements to specify this type of equipment correctly. Also, the standard defines terminology in a further effort to ease the problem of communication between user and manufacturer.

This standard relates directly to IEC Publication 222 (1966) and it is recommended that they be used conjunctively. This standard has been developed under the American National Standards Institute (ANSI) Standards Committee method of procedure under the sponsorship of the Acoustical Society of America. It has been approved by Standards Committee S2 and approved for publication by the Acoustical Society of America.

American National Standards Committee on Mechanical Shock and Vibration, S2, 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.

Suggestions for improvement of this standard will be welcomed. They should be sent to the Standards Secretariat, Acoustical Society of America, 335 East 45th Street, New York, NY 10017.

American National Standards Committee S2 had the following members at the time it processed and approved this standard:

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Writing Group S2-64 on Auxiliary Equipment for Shock and Vibration Measurement, which prepared this revision of ANSI S2.4-1960, included the following members:

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CONTENTS

Acoustical Society of America Standard Method for Specifying the Characteristics of Auxiliary Analog Equipment for Shock and Vibration Measurements

1 INTRODUCTION

Equipment for the measurement of shock and vibration has undergone extensive improvement in the past two decades because of the increased importance of making vibration and shock measurements at extremes of amplitude, frequency, and ambient temperature. Typical measurement applications have included reliability testing for commercial, military, and space equipment; dynamic response measurement for large structures; reduced-scale dynamic simulation; pyrotechnic effect on military, space, and atomic energy devices; fault diagnosis on rotating equipment; safety monitoring on rotating equipment and atomic reactors; and noise reduction of industrial equipment.

In most cases, it is necessary to insert analog signal conditioning equipment between the vibration and shock transducer and the recording, monitoring, or digital signal processing equipment. The analog signal conditioning equipment often takes the form of a voltage amplifier, charge amplifier, direct-coupled differential amplifier, carrier amplifier, filtering circuit, or combination of these components.

The accuracy of the overall vibration measurement and the ease with which this measurement can be accomplished depend to a great extent upon the accuracy and completeness of the information available to the user of the auxiliary equipment. This standard gives the equipment manufacturers a format for uniformly indicating the characteristics of their equipment.

2 PURPOSE AND SCOPE

2.1 Purpose

The purpose of this standard is to provide a uniform terminology and format for the presentation of the performance and other characteristics of auxiliary analog equipment for shock and vibration measurements. This standard will provide the manufacturer with a format that he can use in presenting the performance of his equipment and will provide the equipment user with a standard terminology for requesting information from the manufacturer. As a result of this standard it is expected that the user will obtain a uniform, accurate, and more concise description of the characteristics of the auxiliary equipment.

2.2 Scope

This standard applies to the auxiliary equipment used between a shock or vibration transducer and the final indicator, recorder, or signal processor. This document presents a standard format for indicating pertinent characteristics but does not in any respect become a standard on the performance of the equipment.

Since this standard was prepared to cover a wide variety of equipment in considerable detail, not all items will be pertinent to a specific piece of equipment. Also, it is not the intent of this standard to establish an ironclad rule as to which of the characteristics should be included, although in many cases important characteristics are emphasized.

2.3 Related standards

This standard has been coordinated, as far as possible, with the following American and International Standards now published in preparation or under revision: American National Standard Acoustical Terminology (Including Mechanical Shock and Vibration), S1.1-1960 (R1976); American National Standard Methods for the Calibration of Shock and Vibration Pickups, S2.2-1959 (R1976); and International Electrotechnical Commission Methods for Specifying the Characteristics of Auxiliary Equipment for Shock and Vibration Measurement, IEC Publication 222 (1966).

3 DEFINITIONS AND TERMS

The definitions of many terms used in discussing shock and vibration phenomena are given in American National Standard Acoustical Terminology (Including Mechanical Shock and Vibration), S1.1-1960 (R1976) listed above. Definitions of special significance with regard to this standard are given below.

3.1 Mechanical shock

Mechanical shock occurs when the position, velocity, or acceleration of a mechanical system is significantly changed by an excitation which is usually of short duration relative to the period of the lowest system natural frequency. It is characterized by suddenness and may develop significant inertial and/or elastic forces in the system.

3.2 Oscillation and vibration

Oscillation is the variation of the instantaneous value of a quantity between maximum and minimum values. The variation may be random, deterministic, or have the characteristics of both. Vibration is an oscillation wherein the quantity defines the motion of a mechanical system.