

Mechanical vibration and shock — Signal processing —

Part 1: General introduction

ICS 17.160

National foreword

This British Standard is the UK implementation of ISO 18431-1:2005, incorporating corrigendum May 2009.

The UK participation in its preparation was entrusted by Technical Committee GME/21, Mechanical vibration and shock, to Subcommittee GME/21/2, Vibration and shock measuring instruments and testing equipment.

A list of organizations represented on this subcommittee 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.

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

Amendments/corrigenda issued since publication

Date	Comments
31 August 2009	Implementation of ISO corrigendum May 2009. Equation 9 in Subclause 7.2.3.3 replaced

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 January 2006

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ISBN 978 0 580 68180 6

INTERNATIONAL STANDARD

ISO
18431-1

First edition
2005-11-15

Mechanical vibration and shock — Signal processing

Part 1: General introduction

Vibrations et chocs mécaniques — Traitement du signal

Partie 1: Introduction générale



Reference number
ISO 18431-1:2005(E)



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 18431-1 was prepared by Technical Committee ISO/TC 108, *Mechanical vibration and shock*.

ISO 18431 consists of the following parts, under the general title *Mechanical vibration and shock — Signal processing*:

- *Part 1: General introduction*
- *Part 2: Time domain windows for Fourier Transform analysis*
- *Part 4: Shock response spectrum analysis*

The following parts are under preparation:

- *Part 3: Bilinear methods for joint time-frequency analysis*
- *Part 5: Methods for time-scale analysis*

Introduction

In the recent past, nearly all data analysis has been accomplished through mathematical operations on digitized data. This state of affairs has been accomplished through the widespread use of digital signal acquisition systems and computerized data-processing equipment. The analysis of data is therefore primarily a digital signal-processing task.

The analysis of experimental vibration and shock data should be thought of as a part of the process of experimental mechanics that includes all steps from experimental design through data evaluation and understanding.

This part of ISO 18431 assumes that the data have been sufficiently reduced so that the effects of instrument sensitivity have been included. The data considered in this part of ISO 18431 are considered to be a sequence of time samples of a physical quantity, such as a component of velocity, acceleration, displacement or force. Experimental methods for obtaining these data are outside the scope of this part of ISO 18431.

Mechanical vibration and shock — Signal processing

Part 1: General introduction

1 Scope

This part of ISO 18431 defines the mathematical transformations, including the physical units, that convert each category of vibration and shock data into a form that is suitable for quantitative comparison between experiments and for quantitative specifications. It is applicable to the analysis of vibration that is deterministic or random, and transient or continuous signals. The categories of signals are defined in Clause 6.

Extreme care is to be exercised to identify correctly the type of signal being analysed in order to use the correct transformation and units, especially with the frequency domain analysis.

The data may be obtained experimentally from measurements of a mechanical structure or obtained from numerical simulation of a mechanical structure. This category of data is very broad because there is a wide variety of mechanical structures, for example, microscopic instruments, musical instruments, automobiles, manufacturing machines, buildings and civil structures. The data can determine the response of machines or of humans to mechanical vibration and shock.

2 Normative references

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

ISO 2041:1990, *Vibration and shock — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 2041 and the following apply.

3.1

aliasing

false representation of spectral energy caused by mixing of spectral components above the Nyquist frequency with those spectral components below the Nyquist frequency

3.2

confidence interval

range within which the true value of a statistical quantity will lie, given a value of the probability

3.3

data

sampled measurements of a physical quantity