BS ISO 18437-1:2012

BSI Standards Publication

Mechanical vibration and shock — Characterization of the dynamic mechanical properties of visco-elastic materials

Part 1: Principles and guidelines

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This British Standard is the UK implementation of ISO 18437-1:2012.

The UK participation in its preparation was entrusted to Technical Committee GME/21, Mechanical vibration, shock and condition monitoring.

A list of organizations represented on this committee can be obtained on request to its secretary.

ISBN 978 0 580 73613 1

ICS 17.160

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

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 August 2012.

Amendments issued since publication

Date	Text affected

INTERNATIONAL ISO

First edition
2012-08-15

Mechanical vibration and shock — Characterization of the dynamic mechanical properties of visco-elastic materials —

Part 1: Principles and guidelines

Vibrations et chocs mécaniques — Caractérisation des propriétés mécaniques dynamiques des matériaux visco-élastiques —

Partie 1: Principes et lignes directrices

Reference number
ISO 18437-1:2012(E)

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Published in Switzerland

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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 18437-1 was prepared by Technical Committee ISO/TC 108, *Mechanical vibration, shock and condition monitoring*.

ISO 18437 consists of the following parts, under the general title *Mechanical vibration and shock — Characterization of the dynamic mechanical properties of visco-elastic materials*:

— *Part 1: Principles and guidelines*

— *Part 2: Resonance method*

— *Part 3: Cantilever shear beam method*

— *Part 4: Dynamic stiffness method*

— *Part 5: Poisson ratio based on comparison between measurements and finite element analysis*

Introduction

Visco-elastic materials are used extensively to reduce vibration amplitudes in structural systems through dissipation of energy (damping) or isolation of components, and in acoustical applications that require a modification of the reflection, transmission or absorption of energy. Such systems often require specific dynamic mechanical properties in order to function in an optimum manner. Energy dissipation is due to interactions on the molecular scale and can be measured in terms of the lag between stress and strain in the material. The visco-elastic properties, modulus, and loss factor of most materials depend on frequency, temperature, strain amplitude, and pre-strain. In addition to modulus and loss factor, sometimes Poisson ratio is an important property required for predictions. The choice of a specific material for a given application determines the system performance. The goal of this International Standard is to provide brief descriptions of the three methods for elastic modulus and loss factor and two methods for Poisson ratio, the details of construction of each apparatus, measurement range, and the limitations of each apparatus. This International Standard applies to the linear behaviour observed at small strain amplitudes.

Mechanical vibration and shock — Characterization of the dynamic mechanical properties of visco-elastic materials —

Part 1: Principles and guidelines

1 Scope

This part of ISO 18437 establishes the principles underlying ISO 18437-2 to ISO 18437-5 for the determination of the dynamic mechanical properties (i.e. elastic modulus, shear modulus, bulk modulus, loss factor, and Poisson ratio) of isotropic visco-elastic resilient materials used in vibration isolators from laboratory measurements. It also provides assistance in the selection of the appropriate part of this International Standard.

This part of ISO 18437 is applicable to isotropic resilient materials that are used in vibration isolators in order to reduce:

a) the transmissions of audio frequency vibrations to a structure that can, for example, radiate fluid-borne sound (airborne, structure-borne or other);

b) the transmission of low frequency vibrations which can, for example, act upon humans or cause damage to structures or sensitive equipment when the vibration is too severe;

c) the transmission of shock and noise.

The data obtained with the measurement methods that are outlined in this part of ISO 18437 and further specified in ISO 18437-2 to ISO 18437-5 can be used for:

1) the design of efficient vibration isolators;

2) the selection of an optimum resilient material for a given design;

3) the theoretical computation of the transfer of vibrations through vibration isolators;

4) information during product development;

5) product information provided by manufacturers and suppliers;

6) quality control.

2 Normative references

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

ISO 472, *Plastics — Vocabulary*

ISO 2041, *Mechanical vibration, shock and condition monitoring — Vocabulary*

ISO 4664-1, *Rubber, vulcanized or thermoplastic — Determination of dynamic properties — Part 1: General guidance*

ISO 6721-1, *Plastics — Determination of dynamic mechanical properties — Part 1: General principles*

ISO 10846-2, *Acoustics and vibration — Laboratory measurement of vibro-acoustic transfer properties of resilient elements — Part 2: Direct method for determination of the dynamic stiffness of resilient supports for translatory motion*