INTERNATIONAL STANDARD



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Plastics — Determination of dynamic mechanical properties —

Part 1: General principles

Plastiques — Détermination des propriétés mécaniques dynamiques — Partie 1: Principes généraux



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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 traison 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 orafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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 part of ISO 6721 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 6721-1 was prepared by Technical Committee ISO/TC 61, Plastics, Subcommittee SC 2, Mechanical properties.

This third edition cancels and replaces the second edition (ISO 6721-1:2001), of which it constitutes a minor revision involving the following changes:

- a new subclause (9.6), covering the case when the dynamic-strain amplitude is varied, has been added to the procedure clause;
- the expression of results clause (Clause 10) and the test report clause (Clause 12) have been modified accordingly [Clause 10 by the addition of a new paragraph (me third) and Clause 12 by the addition of a new item, item n)].

Restics — Determination of dynamic ISO 6721 consists of the following parts, under the general title aled of the S mechanical properties:

- Part 1: General principles
- Part 2: Torsion-pendulum method
- Part 3: Flexural vibration Resonance-curve method
- Part 4: Tensile vibration Non-resonance method
- Part 5: Flexural vibration Non-resonance method
- Part 6: Shear vibration Non-resonance method
- Part 7: Torsional vibration Non-resonance method
- Part 8: Longitudinal and shear vibration Wave-propagation method
- Part 9: Tensile vibration Sonic-pulse propagation method
- Part 10: Complex shear viscosity using a parallel-plate oscillatory rheometer

- Part 11: Glass transition temperature
- Part 12: Compressive vibration Non-resonance method

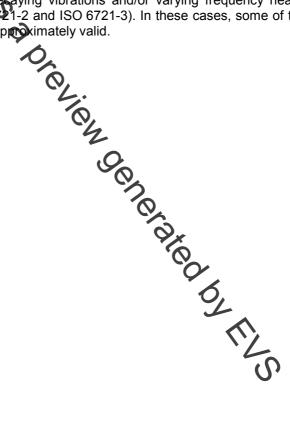
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Introduction

The methods specified in the first nine parts of ISO 6721 can be used for determining storage and loss moduli of plastics over a range of temperatures or frequencies by varying the temperature of the specimen or the frequency of oscillation. Plots of the storage or loss moduli, or both, are indicative of viscoelastic characteristics of the specimen. Regions of rapid changes in viscoelastic properties at particular temperatures or frequencies are normally referred to as transition regions. Furthermore, from the temperature and frequency dependencies of the loss moduli, the damping of sound and vibration of polymer or metal-polymer systems can be estimated.

Apparent discrepancies may arise in results obtained under different experimental conditions. Without changing the observed data, repating in full (as described in the various parts of ISO 6721) the conditions under which the data were obtained will enable apparent differences observed in different studies to be reconciled.

The definitions of complex moduli appropractly only to sinusoidal oscillations with constant amplitude and constant frequency during each measurement. On the other hand, measurements of small phase angles between stress and strain involve some difficulties under these conditions. Because these difficulties are not involved in some methods based on freely decaying vibrations and/or varying frequency near resonance, these methods are used frequently (see ISO 6721-2 and ISO 6721-3). In these cases, some of the equations that define the viscoelastic properties are only approximately valid.



Plastics — Determination of dynamic mechanical properties —

Part 1: General principles

1 Scope

The various parts of ISO 6721 specify methods for the determination of the dynamic mechanical properties of rigid plastics within the region of linear viscoelastic behaviour. This part of ISO 6721 is an introductory section which includes the definitions and all aspects that are common to the individual test methods described in the subsequent parts.

Different deformation modes may produce results that are not directly comparable. For example, tensile vibration results in a stress which is uniform across the whole thickness of the specimen, whereas flexural measurements are influenced preferentially by the properties of the surface regions of the specimen.

Values derived from flexural-test data will be comparable to those derived from tensile-test data only at strain levels where the stress-strain relationship is the and for specimens which have a homogeneous structure.

2 Normative references

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

ISO 291, Plastics — Standard atmospheres for conditioning and testing

ISO 293, Plastics — Compression moulding of test specimens of the proplastic materials

ISO 294 (all parts), Plastics — Injection moulding of test specimens of thermoplastic materials

ISO 295, Plastics — Compression moulding of test specimens of thermosetting materials

ISO 1268 (all parts), Fibre-reinforced plastics — Methods of producting test plates

ISO 2818, Plastics — Preparation of test specimens by machining

ISO 4593, Plastics — Film and sheeting — Determination of thickness by mechanical scanning

ISO 6721-2:2008, Plastics — Determination of dynamic mechanical properties — Part 2: Torsion-pendulum method

ISO 6721-3, Plastics — Determination of dynamic mechanical properties — Part 3: Flexural vibration — Resonance-curve method