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Plastics — Determination of dynamic mechanical properties —

Part 7: Torsional vibration — Non-resonance method

Plastiques — Détermination des propriétés mécaniques dynamiques —

Partie 7: Vibration en torsion — Méthode hors résonance

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 5, *Physical-chemical properties*.

This second edition cancels and replaces the first edition (ISO 6721-7:1996), which has been technically revised. It also incorporates the Amendment ISO 6721-7:1996/Amd.1:2007. The main changes compared to the previous edition are as follows:

— the document has been revised editorially;

— normative references have been changed to undated.

A list of all parts in the ISO 6721 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Plastics — Determination of dynamic mechanical properties —

Part 7: Torsional vibration — Non-resonance method

1 Scope

This document describes a torsional, non-resonance method for determining the components of the shear complex modulus G^* of solid polymers in the form of bars or rods at frequencies typically in the range 0,001 Hz to 100 Hz. Higher-frequency measurements can be made, but significant errors in the dynamic properties measured are likely to result (see 10.2.1 and 10.2.2). The method is suitable for measuring dynamic storage moduli ranging from about 10 MPa, which is typical of values obtained for stiff rubbers, to values of about 10 GPa which are representative of fibre-reinforced plastics. Although materials with moduli less than 10 MPa can be studied, more accurate measurements of their dynamic properties can be made using simple shear (see ISO 6721-6) or torsional deformations of thin layers between parallel plates.

This method is particularly suited to the measurement of loss factors greater than 0,02 and may therefore be conveniently used to study the variation of dynamic properties with temperature and frequency through most of the glass-rubber relaxation region (see ISO 6721-1). The availability of data determined over wide ranges of both frequency and temperature enable master plots to be derived, using frequency-temperature shift procedures, which display dynamic properties over an extended frequency range at different temperatures.

NOTE Although loss factors below 0,1 can be more accurately determined using the torsion pendulum (see ISO 6721-2), the method described in this document enables a much wider and continuous frequency range to be covered.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 6721-1, *Plastics — Determination of dynamic mechanical properties — Part 1: General principles*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6721-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Principle

The specimen is subjected to a sinusoidal torque or angular displacement at a frequency significantly below the fundamental torsion resonance frequency (see 10.2.1). The amplitudes of the torque and displacement cycles applied to the specimen and the phase angle between these cycles are measured.