INTERNATIONAL STANDARD

ISO 6721-6

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Plastics — Determination of dynamic mechanical properties —

Part 6:
Shear vibration — Non-resonance method

Plastiques — Détermination des propriétés mécaniques dynamiques —

Partie 6: Vibration en cisaillement — Méthode hors résonance

Reference number
ISO 6721-6:1996(E)

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.

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.

International Standard ISO 6721-6 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 2, *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: Dynamic shear viscosity using a parallel-plate oscillatory rheometer*

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Plastics — Determination of dynamic mechanical properties —

Part 6:
Shear vibration — Non-resonance method

1 Scope

This part of ISO 6721 describes a forced, non-resonance method for determining the components of the shear complex modulus G^* of polymers at frequencies typically in the range 0,01 Hz to 100 Hz. The method is suitable for measuring dynamic storage moduli in the range 0,1 MPa to 50 MPa. Although materials with moduli greater than 50 MPa may be studied, more accurate measurements of their dynamic shear properties can be made using a torsional mode of deformation (see parts 2 and 7 of ISO 6721).

This method is particularly suited to the measurement of loss factors greater than 0,1 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 6721-1:1994, subclause 9.4). The availability of data determined over wide ranges of both frequency and temperature enables master plots to be derived, using frequency/temperature shift procedures, which display dynamic properties over an extended frequency range at different temperatures.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 6721. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 6721 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 6721-1:1994, *Plastics — Determination of dynamic mechanical properties — Part 1: General principles.*

ISO 6721-2:1994, *Plastics — Determination of dynamic mechanical properties — Part 2: Torsion-pendulum method.*

ISO 6721-7:1996, *Plastics — Determination of dynamic mechanical properties — Part 7: Torsional vibration — Non-resonance method.*

3 Definitions

See ISO 6721-1:1994, clause 3.

4 Principle

A test-specimen assembly is subjected to a sinusoidal shear force or deformation at a frequency significantly below the fundamental shear resonance frequency (see 10.2.1). The amplitudes of the force and displacement cycles applied to the test-specimen assembly and the phase angle between these cycles are measured. The storage and loss components of the shear complex modulus and the loss factor are calculated using equations given in clause 10 of this part of ISO 6721.

5 Apparatus

5.1 Loading assembly

The requirements for the loading assembly are that it shall permit measurements of the amplitudes of, and phase angle between, the force and displacement cycles for a test-specimen assembly subjected to a sinusoidal shear force or deformation. Various designs of apparatus are possible: a suitable version is shown schematically in figure 1. The shear test-specimen assembly consists of two identical specimens S of the polymer bonded to metal end-pieces P_1 and P_2. A sinusoidal force is generated by the vibrator V and applied to the two outer end-pieces P_1 of the test-specimen assembly through the clamping device C_1 of the shear load stage. The amplitude and frequency