SLOVENSKI STANDARD
SIST EN ISO 6721-3:1999

01-maj-1999

Polimerni materiali – Določevanje dinamičnih mehanskih lastnosti – 3. del: Upogibne vibracije – Metoda resonančne krivulje (ISO 6721-3:1994, vključno s tehničnim popravkom 1: 1995)

Plastics - Determination of dynamic mechanical properties - Part 3: Flexural vibration - Resonance-curve method (ISO 6721-3:1994, including Technical Corrigendum 1: 1995)

Kunststoffe - Bestimmung dynamisch-mechanischer Eigenschaften - Teil 3: Biegeschwingung - Resonanzkurven-Verfahren (ISO 6721-3:1994, einschließlich Technische Korrektur 1:1995)

Plastiques - Détermination des propriétés mécaniques dynamiques - Partie 3: Vibration en flexion - Méthode en résonance (ISO 6721-3:1994, Rectificatif Technique 1:1995 inclus)

Ta slovenski standard je istoveten z: **EN ISO 6721-3:1996**

ICS:

83.080.01	Polimerni materiali na splošno	Plastics in general

SIST EN ISO 6721-3:1999 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 6721-3

February 1996

ICS 83.080

Descriptors: see ISO document

English version

Plastics - Determination of dynamic mechanical properties - Part 3: Flexural vibration - Resonance-curve method (ISO 6721-3:1994, including Technical Corrigendum 1:1995)

Plastiques - Détermination des propriétés mécaniques dynamiques - Partie 3: Vibration en flexion -Méthode en résonance (ISO 6721-3:1994, Rectificatif Technique 1:1995 inclus)

Kunststoffe - Bestimmung dynamisch-mechanischer Eigenschaften - Teil 3: Biegeschwingung - Resonanzkurven-verfahren (ISO 6721-3:1994, einschließlich Technische Korrektur 1:1995)

This European Standard was approved by CEN on 1996-01-15. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

The European Standards exist in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

Foreword

The text of the International Standard from Technical Committee ISO/TC 61 "Plastics" of the International Organization for Standardization (ISO) has been taken over as a European Standard by Technical Committee CEN/TC 249 "Plastics", the secretariat of which is held by IBN .

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 1996, and conflicting national standards shall be withdrawn at the latest by August 1996.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 6721-3:1994 including Technical Corrigendum 1:1995 has been approved by CEN as a European Standard without any modification.

INTERNATIONAL STANDARD

ISO 6721-3

First edition
1994-11-01

Plastics — Determination of dynamic mechanical properties —

Part 3: Flexural vibration — Resonance-curve method

Plastiques — Détermination des propriétés mécaniques dynamiques —
Partie 3: Vibration en flexion — Méthode en résonance

Reference number
ISO 6721-3:1994(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 6721-3 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 2, *Mechanical properties*.

Together with ISO 6721-1, it cancels and replaces ISO 6721:1983, which has been technically revised.

ISO 6721 consists of the following parts, under the general title *Plastics — Determination of dynamic 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*

Annexes A and B of this part of ISO 6721 are for information only.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland
Printed in Switzerland

Plastics — Determination of dynamic mechanical properties —

Part 3:
Flexural vibration — Resonance-curve method

1 Scope

This part of ISO 6721 specifies a bending-vibration method based upon resonance curves for determining the flexural complex modulus E_f^* of homogeneous plastics and the damping properties of laminated plastics intended for acoustic insulation, for example systems consisting of a metal sheet coated with a damping plastic layer, or sandwich systems consisting of two sheet-metal layers with an intermediate plastic layer. For many purposes, it is useful to determine these properties as a function of temperature and frequency.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 6721. At the time of publication, the edition indicated was 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 edition of the standard 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.*

3 Definitions

See ISO 6721-1:1994, clause 3.

NOTE 1 As stated in ISO 6721-1, frequencies derived from resonance curves based on deformation-rate amplitude measurements can be exactly related to dynamic properties. For the recommended range of the loss factor of this part of the International Standard, i.e. tan $\delta < 0{,}1$, resonance curves based upon deformation amplitudes can also be used. For highly damping materials, see ISO 6721-1:1994, annex A.

4 Principle

A specimen is submitted to forced bending vibrations in the frequency range between about 10 Hz and 1 000 Hz. The resonance curve (see ISO 6721-1:1994, subclause 3.11) is determined and, from the curve obtained, the flexural storage modulus E'_f (see ISO 6721-1:1994, subclause 3.2) is calculated in the range above 0,5 MPa and the loss factor given by $\tan \delta = E''_f/E'_f$ (see ISO 6721-1:1994, subclause 3.6) is calculated in the range between about 10^{-2} and 10^{-1} (see note 1). The test frequency can be varied by making measurements at more than one vibrational order. The measurement range for the flexural loss modulus E''_f (see ISO 6721-1:1994, subclause 3.3) is determined by that of the loss factor and by the value of the storage modulus.

The mode of oscillation used is designated oscillation mode III (see ISO 6721-1:1994, table 2) and the type of modulus measured is designated E_f (see ISO 6721-1:1994, table 3).

The test is performed on rectangular bars, either mounted vertically with the upper end clamped and the other end free (method A) or suspended horizontally by fine fibres at vibrational nodes (method B) (see figure 1). Method A is suitable for testing specimens

of most types of plastic, including relatively soft materials, whereas method B is particularly suitable for testing rigid (i.e. dimensionally stable) specimens, for example sheet metal covered by a plastic layer for damping purposes.

5 Test apparatus

5.1 General

The apparatus consists of devices for clamping (method A) or suspending (method B) the specimen, electronic devices (frequency generator and recording device) for exciting the specimen to forced bending vibration and for measuring the frequency as well as the velocity amplitude of the specimen (see note 1). For excitation and detection of the vibrations two electromagnetic transducers are situated near the ends of the specimen. The specimen, the clamping or supporting device and the electromagnetic transducers are enclosed in a temperature-controlled chamber (see figure 1).

5.2 Clamps or suspension fibres

If the specimen is clamped at one end, the clamp shall be designed to hold the upper end of the specimen securely and tightly [see figure 1 a)]. It shall be constructed so that no additional damping of the system occurs.

There are two causes of additional damping:

— Friction between the test specimen and the clamp: This can be detected by stimulating freely decaying oscillations of the relevant vibrational order. As explained in ISO 6721-1:1994, annex B, the type of decay is indicative of different types of deviation from linear viscoelastic behaviour.

— Vibration of the clamp: The clamp shall be rigidly mounted on a heavy mass, which acts as a counterweight to the oscillating test specimen. This requires a heavy rigid stand within the temperature-controlled chamber (see figure 1).

If the specimen is tested in the horizontal position, it shall be supported by two fine fibres at vibrational nodes (see 9.3.2).

5.3 Exciter and detector

The frequency generator shall be capable of exciting the specimen with the aid of the electromagnetic transducer to oscillations within the frequency range of 10 Hz to 1 000 Hz with a constant force amplitude.

The detector shall be capable of measuring the deformation or deformation-rate amplitude (see note 1) of the specimen and the frequency of the oscillation, thereby permitting the recording of the resonance curve (see ISO 6721-1:1994, subclause 3.11 and annex A).

The amplitude of the exciter and the sensitivity of the detector shall not vary with frequency by more than 0,5 % within the range of a single-resonance peak, i.e. for any 10 % variation of the frequency.

A tracking filter shall be used to minimize noise at the detector. Frequencies shall be measured with a resolution of at least 0,1 % (see 11.2).

Two small, thin steel plates shall be adhesively bonded at the ends of the specimen to permit the excitation and detection of the vibrations by means of suitable electromagnetic transducers (see 6.2).

5.4 Temperature-controlled enclosure

See ISO 6721-1:1994, subclause 5.3.

5.5 Gas supply

Supply of air or other suitable inert gas for purging purposes.

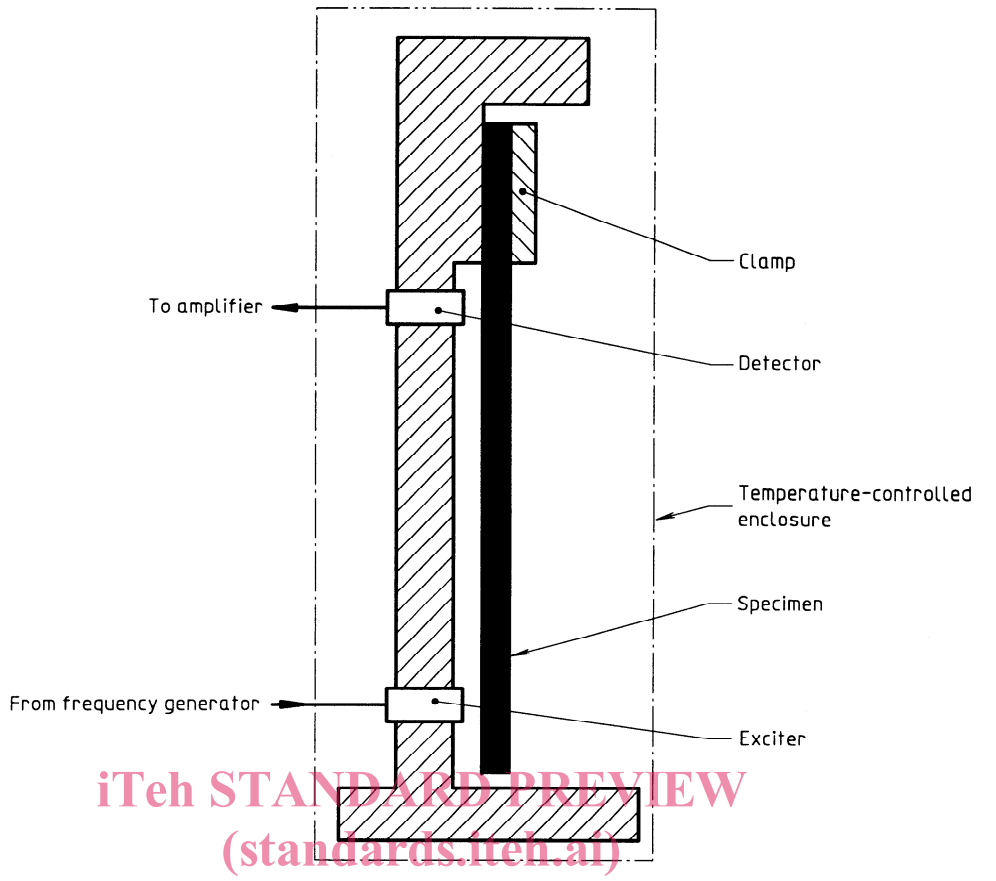
5.6 Temperature-measurement device

See ISO 6721-1:1994, subclause 5.5.

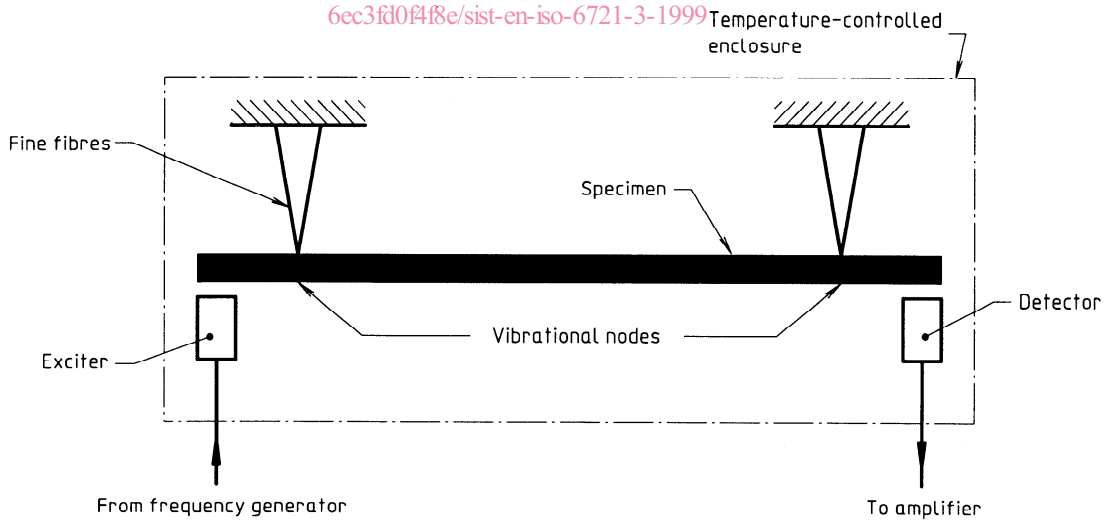
5.7 Devices for measuring test specimen dimensions and density

See ISO 6721-1:1994, subclause 5.6.

The balance used for measuring the mass of the specimen shall be capable of weighing to 1 mg.



a) Method A



b) Method B

Figure 1 — Schematic diagrams of test apparatus for methods A and B