
**Plastics — Determination of dynamic
mechanical properties —**

**Part 4:
Tensile vibration — Non-resonance
method**

*Plastiques — Détermination des propriétés mécaniques dynamiques —
Partie 4: Vibration en traction — Méthode hors résonance*



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Published in Switzerland

Contents

Page

Foreword.....	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions.....	1
4 Principle.....	1
5 Test device	2
6 Test specimens	3
7 Number of specimens.....	4
8 Conditioning.....	4
9 Procedure	4
10 Expression of results	5
11 Precision.....	8
12 Test report	8

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 6721-4 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 2, *Mechanical properties*.

This second edition cancels and replaces the first edition (ISO 6721-4:1994), of which it constitutes a minor revision. The main change is the updating of the normative references.

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*
- *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*

Plastics — Determination of dynamic mechanical properties —

Part 4:

Tensile vibration — Non-resonance method

1 Scope

This part of ISO 6721 describes a forced, non-resonance method for determining the components of the tensile complex modulus E^* 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 0,01 GPa to 5 GPa. Although materials with moduli outside this range may be studied, alternative modes of deformation should yield higher accuracy [i.e. a shear mode for $E' < 0,01$ GPa (see ISO 6721-6) and a flexural mode for $E' > 5$ GPa (see ISO 6721-3 or ISO 6721-5)].

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 6721-1:2001, 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 referenced documents are indispensable for the application 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 6721-1:2001, *Plastics — Determination of dynamic mechanical properties — Part 1: General principles*

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

ISO 6721-5, *Plastics — Determination of dynamic mechanical properties — Part 5: Flexural vibration — Non-resonance method*

ISO 6721-6, *Plastics — Determination of dynamic mechanical properties — Part 6: Shear vibration — Non-resonance method*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6721-1:2001, Clause 3, apply.

4 Principle

The specimen is subjected to a sinusoidal tensile force or deformation at a frequency significantly below the fundamental resonance frequency for the clamped/free longitudinal mode (see 10.2.2). The amplitudes of the