INTERNATIONAL STANDARD

ISO 6721-10

Third edition
2015-09-15

Plastics — Determination of dynamic mechanical properties —

Part 10: Complex shear viscosity using a parallel-plate oscillatory rheometer

Plastiques — Détermination des propriétés mécaniques dynamiques —

Partie 10: Viscosité complexe en cisaillement à l'aide d'un rhéomètre à oscillations à plateaux parallèles

Reference number
ISO 6721-10:2015(E)

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information.

The committee responsible for this document is ISO/TC 61, *Plastics*, Subcommittee SC 5, *Physical-chemical properties*.

This third edition cancels and replaces the second edition (ISO 6721-10:1999), which has been technically revised to include informative guidance on verification of the instruments performance (Annex B).

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*

— *Part 11: Glass transition temperature*

— *Part 12: Compressive vibration — Non-resonance method*

Annex A and Annex B of this part of ISO 6721 is for information only.

Plastics — Determination of dynamic mechanical properties —

Part 10: Complex shear viscosity using a parallel-plate oscillatory rheometer

1 Scope

This part of ISO 6721 specifies the general principles of a method for determining the dynamic rheological properties of polymer melts at angular frequencies typically in the range of 0,01 rad·s^{-1} to 100 rad·s^{-1} by means of an oscillatory rheometer with a parallel-plate geometry. Angular frequencies outside this range can also be used (see Note 1). The method is used to determine values of the following dynamic rheological properties: complex shear viscosity η^*, dynamic shear viscosity η', the out-of-phase component of the complex shear viscosity η'', complex shear modulus G^*, shear loss modulus G'', and shear storage modulus G'. It is suitable for measuring complex shear viscosity values typically up to ~10 MPa·s (see Note 2).

NOTE 1 The angular-frequency measurement range is limited by the specification of the measuring instrument and also by the response of the specimen. When testing using angular frequencies lower than 0,1 rad·s^{-1}, the test time can increase significantly as the time taken to obtain a single measurement is proportional to the reciprocal of the angular frequency. Consequently, when testing at low angular frequencies, degradation or polymerization of the specimen is more likely to occur and have an effect on the results. At high angular frequencies, the specimen can distort or fracture at the edge, consequently invalidating the test results.

NOTE 2 The range of complex shear viscosity values that can be measured is dependent on the specimen dimensions and also the specification of the measuring instrument. For a specimen of given dimensions, the upper limit of the range is limited by the machine's torque capacity, angular-displacement resolution, and compliance. However, correction can be made for compliance effects.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 472, *Plastics — Vocabulary*

ISO 5725-1, *Accuracy (trueness and precision) of measurement methods and results — Part 1: General principles and definitions*

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, ISO 5725-1, ISO 472, and the following apply.

3.1
controlled-strain mode
testing by applying a sinusoidal angular displacement of constant amplitude