
**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



This document is a preview generated by EKO



COPYRIGHT PROTECTED DOCUMENT

© ISO 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Published in Switzerland

Contents

Page

Foreword	iv
1 Scope	1
2 Normative reference	1
3 Terms and definitions	1
4 Principle	1
5 Test apparatus	2
5.1 General	2
5.2 Clamps or suspension fibres	2
5.3 Exciter and detector	2
5.4 Temperature-controlled enclosure	3
5.5 Gas supply	3
5.6 Temperature-measurement device	3
5.7 Devices for measuring test specimen dimensions	4
6 Test specimens	4
6.1 General	4
6.2 Shape and dimensions	5
6.3 Preparation	5
7 Number of test specimens	5
8 Conditioning	5
9 Procedure	5
9.1 Test atmosphere	5
9.2 Measurement of specimen cross-section	5
9.3 Measurement of specimen density	5
9.4 Mounting the test specimens and adjustment of the transducers	6
9.4.1 Method A	6
9.4.2 Method B	6
9.4.3 Adjustment of the transducers	6
9.5 Varying the temperature	6
9.6 Varying the frequency	6
9.7 Recording the resonance curve	6
10 Expression of results	7
10.1 Symbols	7
10.2 Calculation of flexural storage modulus, E'_f	7
10.3 Calculation of flexural loss factor, $\tan \delta_f$	8
10.4 Calculation of flexural loss modulus, E''_f	8
10.5 Plotting the complex modulus as a function of temperature	8
11 Precision	8
11.1 Storage modulus	8
11.2 Loss factor	8
11.3 Precision of the methods	9
12 Test report	9
Annex A (informative) Interlaboratory testing	10
Bibliography	13

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*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 249, *Plastics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 6721-3:1994), which has been technically revised. It also incorporates the Technical Corrigendum ISO 6721-3:1994/Cor 1:1995.

The main changes compared to the previous edition are as follows:

- the document has been revised editorially;
- the normative references have been updated;
- the NOTE in [Clause 3](#) has been moved to [Clause 4](#);
- the method of specimen density measurement has been defined.

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 3: Flexural vibration — Resonance-curve method

1 Scope

This document 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 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 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method*

ISO 1183-2, *Plastics — Methods for determining the density of non-cellular plastics — Part 2: Density gradient column method*

ISO 1183-3, *Plastics — Methods for determining the density of non-cellular plastics — Part 3: Gas pycnometer method*

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

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) is determined and, from the curve obtained, the flexural storage modulus E_f' is calculated in the range above 0,5 MPa and the loss factor given by $\tan \delta = E_f''/E_f'$ is calculated in the range between about 10^{-2} and 10^{-1} (see NOTE). 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'' is determined by that of the loss factor and by the value of the storage modulus.