

---

---

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

**Part 8:  
Longitudinal and shear vibration —  
Wave-propagation method**

*Plastiques — Détermination des propriétés mécaniques  
dynamiques —*

*Partie 8: Vibrations longitudinale et en cisaillement — Méthode de  
propagation des ondes*



This document is a preview generated by EMS



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2019

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  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

	Page
Foreword .....	iv
<b>1 Scope .....</b>	<b>1</b>
<b>2 Normative references .....</b>	<b>1</b>
<b>3 Terms and definitions .....</b>	<b>1</b>
<b>4 Principle .....</b>	<b>2</b>
<b>5 Testing device .....</b>	<b>2</b>
5.1 Apparatus .....	2
5.1.1 Method A: Immersion method .....	3
5.1.2 Method B: Transducer contact method .....	3
5.2 Transducers .....	3
5.3 Transit-time measurement equipment .....	3
5.4 Temperature measurement and control .....	4
<b>6 Test specimens .....</b>	<b>4</b>
6.1 General .....	4
6.2 Shape and dimensions .....	4
6.3 Preparation .....	4
<b>7 Number of specimens .....</b>	<b>4</b>
<b>8 Conditioning .....</b>	<b>4</b>
<b>9 Procedure .....</b>	<b>4</b>
9.1 Test atmosphere .....	4
9.2 Measuring the specimen dimension .....	5
9.3 Performing the test .....	5
9.3.1 Method A: Immersion method .....	5
9.3.2 Method B: Transducer contact method .....	5
9.3.3 Measurement of the specimen density .....	5
9.4 Varying the temperature .....	6
<b>10 Expression of the results .....</b>	<b>6</b>
10.1 Symbols .....	6
10.2 Determination of the longitudinal wave velocity $v_L$ .....	6
10.2.1 Method A: Immersion method .....	6
10.2.2 Method B: Transducer contact method .....	7
10.3 Determination of the transverse wave velocity $v_T$ .....	7
10.3.1 Method A: Immersion method .....	7
10.3.2 Method B: Transducer contact method .....	8
10.4 Calculation of dynamic properties .....	8
10.5 Influence of material anisotropy .....	8
<b>11 Precision .....</b>	<b>9</b>
<b>12 Test report .....</b>	<b>9</b>

## 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](http://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](http://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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 5, *Physical-chemical properties*.

This second edition cancels and replaces the first edition (ISO 6721-8:1997), which has been technically revised. The main changes compared to the previous edition are as follows:

- the document has been revised editorially;
- normative references have been changed to undated.

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](http://www.iso.org/members.html).

# Plastics — Determination of dynamic mechanical properties —

## Part 8: Longitudinal and shear vibration — Wave-propagation method

### 1 Scope

This document describes an ultrasonic wave propagation method for determining the storage components of the longitudinal complex modulus  $L^*$  and the shear complex modulus  $G^*$  of polymers at discrete frequencies typically in the range 0,5 MHz to 5 MHz. The method is suitable for measuring materials with storage moduli in the range 0,01 GPa to 200 GPa and with loss factors below 0,1 at around 1 MHz. With materials that have a higher loss, significant errors in velocity measurement are introduced through waveform distortion and can only be reduced using procedures that are outside the scope of this document.

The method allows measurements to be made on small specimens, typically 50 mm × 20 mm × 5 mm, or small regions of larger specimens or sheets. It is therefore possible to obtain information on the homogeneity or anisotropy (see 10.5) of modulus in a specimen.

### 2 Normative references

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 and the following 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/>