INTERNATIONAL STANDARD

**ISO 22007-2**

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# Plastics — Determination of thermal conductivity and thermal diffusivity —

## Part 2: Transient plane heat source (hot disc) method

*Plastiques — Détermination de la conductivité thermique et de la diffusivité thermique —*

*Partie 2: Méthode de la source plane transitoire (disque chaud)*

Reference number
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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.

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 22007-2 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 5, *Physical-chemical properties*.

ISO 22007 consists of the following parts, under the general title *Plastics — Determination of thermal conductivity and thermal diffusivity*:

— *Part 1: General principles*

— *Part 2: Transient plane heat source (hot disc) method*

— *Part 3: Temperature wave analysis method*

— *Part 4: Laser flash method*

In this corrected version of ISO 22007-2:2008, Figure 3 has been amended to remove a horizontal line running between $\Delta U$ and the earth connection.



 

# Introduction

A significant increase in the development and application of new and improved materials for broad ranges of physical, chemical, biological and medical applications has necessitated better performance data from methods of measurement of thermal-transport properties. The introduction of alternative methods that are relatively simple, fast and of good precision would be of great benefit to the scientific and engineering communities [1].

A number of measurement techniques described as contact transient methods have been developed and several have been commercialized. These are being widely used and are suitable for testing many types of material. In some cases, they can be used to measure several properties separately or simultaneously [2],[3].

A further advantage of some of these methods is that it has become possible to measure the true bulk properties of a material. This feature stems from the possibility of eliminating the influence of the thermal contact resistance (see 8.1.1) that is present at the interface between the probe and the specimen surfaces [1],[3],[4],[5],[6].

# Plastics — Determination of thermal conductivity and thermal diffusivity —

## Part 2:
## Transient plane heat source (hot disc) method



## 1 Scope

**1.1** This part of ISO 22007 specifies a method for the determination of the thermal conductivity and thermal diffusivity, and hence the specific heat capacity per unit volume, of plastics. The experimental arrangement can be designed to match different specimen sizes. Measurements can be made in gaseous and vacuum environments at a range of temperatures and pressures.

**1.2** This method is suitable for testing homogeneous and isotropic materials, as well as anisotropic materials with a uniaxial structure. In general, the method is suitable for materials having values of thermal conductivity, $\lambda$, in the approximate range $0{,}01\ \mathrm{W{\cdot}m^{-1}{\cdot}K^{-1}} < \lambda < 500\ \mathrm{W{\cdot}m^{-1}{\cdot}K^{-1}}$ and values of thermal diffusivity, $\alpha$, in the range $5 \times 10^{-8}\ \mathrm{m^2{\cdot}s^{-1}} \leqslant \alpha \leqslant 10^{-4}\ \mathrm{m^2{\cdot}s^{-1}}$, and for temperatures, $T$, in the approximate range $50\ \mathrm{K} < T < 1\ 000\ \mathrm{K}$.

NOTE The specific heat capacity per unit volume, $C$, can be obtained by dividing the thermal conductivity, $\lambda$, by the thermal diffusivity, $\alpha$, i.e. $C = \lambda/\alpha$, and is in the approximate range $0{,}2\ \mathrm{MJ{\cdot}m^{-3}{\cdot}K^{-1}} < C < 5\ \mathrm{MJ{\cdot}m^{-3}{\cdot}K^{-1}}$. It is also referred to as the volumetric heat capacity.

**1.3** The thermal-transport properties of liquids can also be determined, provided care is taken to minimize thermal convection.

## 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 472, *Plastics — Vocabulary*

ISO 22007-1, *Plastics — Determination of thermal conductivity and thermal diffusivity — Part 1: General principles*