



BSI Standards Publication

Thermal insulation — Test method for thermal diffusivity — Periodic heat method

National foreword

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*Isolation thermique — Méthode d'essai pour la diffusivité thermique
— Méthode de chauffage périodique*



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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).

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This document was prepared by Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 1, *Test and measurement methods*.

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.

Thermal insulation — Test method for thermal diffusivity — Periodic heat method

1 Scope

This document specifies a periodic heat method for measurement of the thermal diffusivity of thermal insulation material in the shape of a flat plate.

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 8302:1991, *Thermal insulation — Determination of steady-state thermal resistance and related properties — Guarded hot plate apparatus*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/>

3.1

phase

quantity that shows the stage of progress in one *period* (3.5) of wave motion and other periodic phenomenon

EXAMPLE $\omega t + \varphi_1$ in $y = A \sin(\omega t + \varphi_1)$ is the phase.

3.2

phase lag

difference between two *phases* (3.1) provided by periodic temperature changes measured at two different points on the surface and inside a test specimen

EXAMPLE When the periodic temperature changes 1 and 2 are given by $y_1 = A_1 \sin(\omega t + \varphi_1)$ and $y_2 = A_2 \sin(\omega t + \varphi_2)$, respectively, the phase lag between them is $\varphi_2 - \varphi_1$.

3.3

amplitude

half of the difference between the maximum and minimum values of the amount of displacement in a periodic temperature change

EXAMPLE A in a sine wave given by $A \sin(\omega t + \varphi)$ or $A \exp[i(\omega t + \varphi)]$ refers to the amplitude.

3.4 amplitude ratio

ratio of two *amplitudes* (3.3) provided by periodic temperature changes measured at any point on the surface and inside a test specimen.

EXAMPLE When the periodic temperature changes y_1 on the surface and y_2 inside the test specimen are given by $y_1 = A_1 \sin(\omega t + \phi_1)$ and $y_2 = A_2 \sin(\omega t + \phi_2)$, respectively, the amplitude ratio between the two amplitudes is A_2/A_1 .

3.5 period

reproduction interval of a periodic phenomenon (or a periodic function)

Note 1 to entry: When the time interval is constant, the period f is given by $f = 1/\nu = 2\pi/\omega$, where ν is the *frequency* (3.6) and ω is the *angular frequency* (3.7).

3.6 frequency

number of repetitions of the same state within a certain time interval of any temporal periodic phenomena

Note 1 to entry: It is expressed as $\nu = 1/f$, where f is the *period* (3.5).

3.7 angular frequency

rotation angle per second

Note 1 to entry: Angular frequency is obtained by multiplying the *frequency* (3.6) ν by 2π ($2\pi\nu$) or by multiplying the reciprocal of the *period* (3.5) f by 2π ($2\pi/f$).

4 Symbols

The symbols used in this document are given in Table 1.

Table 1 — Symbols

Symbol	Quantity	Unit
a	Thermal diffusivity	m^2/s
c	Specific heat capacity	$\text{J}/(\text{kg}\cdot\text{K})$
D	Difference	%
d	Thickness of test specimen (total thickness of the two pieces when using two stacked test pieces in a measurement)	m
f	Period	s
i	Imaginary unit	-
k	Damping coefficient	1/m
L	Length of one side of test specimen	m
l	Distance from periodic heating surface ($d - x_m$)	m
m	Mass prior to measuring thermal diffusivity (prior to grooving)	kg
T	Absolute temperature	K
V	Volume prior to measuring thermal diffusivity (prior to grooving)	m^3
x	x coordinate	m
x_m	Location of temperature measurement point inside a test specimen	m
ε	Phase lag on $x = 0$ surface	rad