



BSI Standards Publication

Thermal insulation of building elements — In-situ measurement of thermal resistance and thermal transmittance

Part 3: Probe insertion method

National foreword

This British Standard is the UK implementation of ISO 9869-3:2023.

The UK participation in its preparation was entrusted to Technical Committee B/540/8, Mirror committee for ISO/TC 163 - Thermal Performance and Energy use in the built Environment.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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© The British Standards Institution 2023
Published by BSI Standards Limited 2023

ISBN 978 0 539 18823 3

ICS 91.120.10

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 November 2023.

Amendments/corrigenda issued since publication

Date	Text affected

**Thermal insulation of building
elements — In-situ measurement
of thermal resistance and thermal
transmittance —**

**Part 3:
Probe insertion method**

*Isolation thermique des éléments de construction — Mesurage in
situ de la résistance thermique et du coefficient de transmission
thermique —*

Partie 3: Méthode par insertion d'une sonde





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Published in Switzerland

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Foreword

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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*.

A list of all parts in the ISO 9869 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.

Introduction

The ISO 9869 series describes the in-situ measurement of the thermal transmission properties of plane building components, primarily consisting of opaque layers perpendicular to the heat flow and having no significant lateral heat flow. The thermal transmittance of a building element (U-value) is defined in ISO 7345 as the heat flux per unit area and unit temperature difference in the steady state condition. Since steady state conditions are never encountered on a site in practice, such a simple measurement is not possible. Although various statistical methods have been introduced to address this problem, one of the simplest is the use of the mean values over a sufficiently long period of time. The required time for observation for reliable measurements depends on the thermal properties of the building components and the nature of the temperature difference between the surroundings on each of the sides thereof.

ISO 9869-1 describes the method used to estimate the thermal steady state properties of a building element from heat flow meter (HFM) measurements through plane building components. [Annex B](#) describes the statistical methods of the simple mean and the sophisticated method of dynamic analysis for steady state properties. This document describes a screening test of the insulation condition and thermal resistance of existing building elements by visual observation with a borescope and by measurement of the temperature gradient and heat flow with a temperature sensing rod and HFM. Although the method used in this document is not a non-destructive inspection method, the diameter of the borehole drilled through the building element is approximately less than 2 mm. The method described in this document is intended for use as a practical diagnostic procedure of the thermal transmission properties of plane building components with light heat capacity such as those in frame structure dwelling.

The thermal performance of a part of the building element is evaluated by obtaining the temperature gradient through the building element and the heat flow rate. The thermal transmittance (thermal resistance) of the insulation layer of the building components for the steady state condition can be obtained by using the averages of the observed values over a certain period of time.

Thermal insulation of building elements — In-situ measurement of thermal resistance and thermal transmittance —

Part 3: Probe insertion method

1 Scope

This document describes a method for measuring the insulation performance of building elements, e.g. exterior walls, floors, ceilings (hereinafter referred to collectively as "walls"). This is done by using the probe insertion method, which gives the temperature distribution in the wall with a temperature sensor in a small diameter borehole in the wall.

The measurement method is divided into a quantitative method, which measures the thermal resistance with a heat flow measurement, and a qualitative method without heat flow measurement.

This document describes a screening test that is used for preliminary and practical diagnosis.

The method is applicable to plane building components with a light heat capacity, such as those in frame structure dwellings. The measured results give the insulation performance at the local measurement points rather than that of the whole panel including thermal bridges such as studs.

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 7345, *Thermal performance of buildings and building components — Physical quantities and definitions*

ISO 9869-1, *Thermal insulation — Building elements — In-situ measurement of thermal resistance and thermal transmittance — Part 1: Heat flow meter method*

IEC 60584-1, *Thermocouples—Part 1: EMF specifications and tolerances*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7345 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

borescope

optical device consisting of a rigid or flexible tube with an eyepiece on one end and an objective lens on the other end, linked together by a relay optical system in between, which is surrounded by optical fibres used for illumination of the remote object

Note 1 to entry: Rigid or flexible borescopes may be fitted with an imaging or video device.