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

## Part 1: Heat flow meter method

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

*Partie 1: Méthode du fluxmètre*



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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](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)).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 1, *Test and measurement methods*.

This first edition cancels and replaces ISO 9869:1994, which has been technically revised.

[Annexes A, B and C](#) form an integral part of this part of ISO 9869. [Annexes D, E and F](#) are for information only.

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## Introduction

The thermal transmittance of a building element ( $U$ -value) is defined in ISO 7345 as the “Heat flow rate in the steady state divided by area and by the temperature difference between the surroundings on each side of a system”.

In principle, the  $U$ -value can be obtained by measuring the heat flow rate through an element with a heat flow meter or a calorimeter, together with the temperatures on both sides of the element under steady-state conditions.

However, since steady-state conditions are never encountered on a site in practice, such a simple measurement is not possible. But there are several ways of overcoming this difficulty:

- a) Imposing steady-state conditions by the use of a hot and a cold box. This method is commonly used in the laboratory (ISO 8990) but is cumbersome in the field;
- b) Assuming that the mean values of the heat flow rate and temperatures over a sufficiently long period of time give a good estimate of the steady-state. This method is valid if:
  - 1) the thermal properties of the materials and the heat transfer coefficients are constant over the range of temperature fluctuations occurring during the test;
  - 2) the change of amount of heat stored in the element is negligible when compared to the amount of heat going through the element. This method is widely used but may lead to long periods of measurement and may give erroneous results in certain cases.
- c) Using a dynamic theory to take into account the fluctuations of the heat flow rate and temperatures in the analysis of the recorded data.

**NOTE** The temperatures of the surroundings, used in the definition of the  $U$ -value, are not precisely defined in ISO 7345. Their exact definition depends on the subsequent use of the  $U$ -value and may be different in different countries (see [Annex A](#)).