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**Fire tests — Calibration and use of heat  
flux meters —**

**Part 3:  
Secondary calibration method**

*Essais au feu — Étalonnage et utilisation des appareils de mesure du  
flux thermique —*

*Partie 3: Méthode d'étalonnage secondaire*



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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 14934-3 was prepared by Technical Committee ISO/TC 92, *Fire safety*, Subcommittee SC 1, *Fire initiation and growth*.

ISO 14934 consists of the following parts, under the general title *Fire tests — Calibration and use of heat flux meters*:

- *Part 1: General principles* [Technical Specification]
- *Part 2: Primary calibration methods*
- *Part 3: Secondary calibration method*
- *Part 4: Guidance on the use of heat-flux meters in fire tests* [Technical Specification]

## Introduction

In many fire test methods, the radiation level is specified and, therefore, it is of great importance that the radiant heat flux is well defined and measured with sufficient accuracy. Radiant heat transfer is also the dominant mode of heat transfer in most real fires.

In practice, radiant heat flux is usually measured with total heat flux meters of the Schmidt-Boelter (thermopile) or Gardon (foil) type. Such meters register the combined heat flux by radiation and convection to a cooled surface. The contribution to the heat transfer by convection depends mainly on the temperature difference between the surrounding gases and the sensing surface, and on the velocity of the surrounding gases. It, however, also depends on the size and shape of the heat flux meter, its orientation and on its temperature level, which is near the cooling water temperature. In many practical situations in fire testing, the contribution due to convection to the sensing surface of the instrument can amount to 25 % of the radiant heat flux. Therefore, it is always necessary to determine and control this part.

To determine the fraction of total heat flux due to radiation, a calibration scheme has been developed where primary calibration is performed on two different types of heat flux meters: (1) a total hemispherical radiometer sensitive to radiation only, and (2) a total heat flux meter (most frequently used) sensitive to both radiant heat transfer and to convective heat transfer. A comparison of measurements between the two types of meters in secondary (or transfer) calibration methods allows a characterization of the influence of convection in the method. Where possible, in calibrations and in measurements of radiative heat flux, it is advisable that the uncertainty calculations include the uncertainty associated with removing the convective component. For secondary calibration methods, a combined use of hemispherical radiometers and total heat flux meters makes it possible to estimate the convection contribution. The same arrangement can be used in the calibration of fire-test methods as well.

This part of ISO 14934 describes a method for the calibration of total heat flux meters used in fire testing. A number of fire tests described in International Standards published by ISO require test specimens to be exposed to specified levels of irradiance. It is, therefore, necessary for fire test laboratories to be able to maintain working-standard heat flux meters to measure irradiance.

This part of ISO 14934 describes a method for the calibration of heat flux meters for use as working standards by comparison with a heat flux meter of known sensitivity, referred to as a secondary standard. The latter will have been calibrated by reference to a defined primary standard of irradiance from a close-to-black source.

The calibration of heat flux meters for use as primary and secondary standards requires considerable expertise and equipment that is not covered by this part of ISO 14934. For information on the calibration of primary standards and for a detailed account of the principles of the measurement of thermal radiation, reference is also made to ISO 14934-2.

Information on the accuracy of calibration, care of heat flux meters and guidance notes for carrying out the calibration are given in Annexes A to C. Annex D outlines a suitable procedure for the maintenance of a secondary standard of irradiance at a test laboratory.

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# Fire tests — Calibration and use of heat flux meters —

## Part 3: Secondary calibration method

### 1 Scope

This part of ISO 14934 specifies a method for the calibration of heat flux meters for use in fire testing.

This method applies only to instruments having plane sensing surfaces. It does not apply to sensing surfaces in the form of wires, spheres, etc.

Annex A gives information on the accuracy of the calibration. It is intended that reference be made to the International Standard describing the test for which the heat flux meter is intended. Annex B gives guidance on the care of heat flux meters. Annex C gives guidance notes concerning calibration.

### 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 13943:2000, *Fire safety — Vocabulary*

ISO 14934-2, *Fire tests — Calibration and use of heat flux meters — Part 2: Primary calibration methods*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14934-2 and ISO 13943:2000 apply.

### 4 Principle

Calibration of heat flux meters (total hemispherical radiometers and total heat flux meters) for use as working standards is carried out by comparing heat flux meter response at various levels of irradiance with the response of a secondary-standard heat flux meter of the same type at the same levels of irradiance. The measurements are made at different levels of irradiance, which is obtained by varying the distance between the radiant source and the heat flux meter or by varying the temperature of the radiant source. The secondary-standard heat flux meter shall be calibrated according to one of the primary methods described in ISO 14934-2.

Working standard heat flux meters may also be calibrated directly in any of the primary calibration furnaces described in ISO 14934-2. In this case, it is not necessary to follow the calibration procedure described in this part of ISO 14934.