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

**Part 4:
Guidance on the use of heat flux meters
in fire tests**

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

*Partie 4: Lignes directrices pour l'utilisation des fluxmètres thermiques
dans les essais au feu*



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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.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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/TS 14934-4 was prepared by Technical Committee ISO/TC 92, *Fire safety*, Subcommittee SC 1, *Fire initiation and growth*.

ISO/TS 14934 consists of the following parts, under the general title *Fire tests — Calibration 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 practice, radiant heat flux is usually measured with so-called 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 will, however, also depend 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:

- a total hemispherical radiation meter sensitive to radiation only;
- a total heat flux meter (most frequently used) sensitive to both radiant heat transfer and to convective heat transfer.

When using heat flux meters, it is important to realize that only incident radiant heat flux can be measured directly. The net radiant heat flux, as well as the heat transfer by convection to a body, depend on, among other things, the temperature of the receiving surface, while the instrument responds to heat transfer to a cooled surface.

This Technical Specification provides guidance on how this type of instrument is used and how the results are interpreted.

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Fire tests — Calibration of heat flux meters —

Part 4:

Guidance on the use of heat flux meters in fire tests

1 Scope

This Technical Specification provides guidance on the use of heat flux meters in fire testing applications, including the description and working principles of common heat flux meters and methods for their selection and maintenance. The guidance can also be applied to measuring heat flux from radiant panels and other large heat sources used to simulate the heat flux from a fire. It is applicable for all common testing purposes when measuring heat flux from radiant sources.

This Technical Specification also provides basic theory and working principles of heat flux meters and methods for selection, use and maintenance of heat flux meters. Although it is particularly aimed at the application of heat flux meters in fire tests and experimental works concerning fire research, it can also serve as a guide for other research applications, for example, research on boilers, combustion processes, etc.

Instruments, which measure the transient temperature of a solid body of known mass and heat capacity to infer the heat flux (slug calorimeter type), are not covered by this Technical Specification.

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 14934-2:2006, *Fire tests — Calibration and use of heat flux meters — Primary calibration methods*

ISO 14934-3, *Fire tests — Calibration and use of heat flux meters — Secondary calibration method*

3 Terms and definitions

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

4 General information on heat flux meters

4.1 General

A heat flux meter is an instrument which measures the radiant and convective heat that is transferred from the fire environment to a sensing element. In practice, heat flux is most commonly measured with total heat flux meters of the Schmidt-Boelter (thermopile) or Gardon (foil) type. Although there is a wide variety of designs of heat flux meters, a typical design consists of a thermopile sensor, mounted on a metal body that is cooled by water. The body acts as a constant-temperature heat sink. The thermopile sensor typically has a nearly black surface which is assumed to absorb all incident radiation, or of which the emissivity is given.