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**Protective clothing against heat
and flame — Determination of heat
transmission on exposure to flame**

*Vêtements de protection contre la chaleur et les flammes —
Détermination de la transmission de chaleur à l'exposition d'une
flamme*



Reference number
ISO 9151:2016(E)

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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. 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. 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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see the following URL: <http://www.iso.org/iso/foreword.html>

The committee responsible for this document is ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 13, *Protective clothing* and by Technical Committee CEN/TC 162, *Protective clothing including hand and arm protection and lifejackets* in collaboration.

This second edition cancels and replaces the first edition (ISO 9151:1995), of which Clauses/[subclauses 2, 3.3, 5.1, 5.2, 5.3, 5.6, 6, 8.1, 8.2, 9.1.2, 9.3.1, 9.3.2, 10](#), all figures, and [Annexes A and B](#) have been technically revised. Tolerances have been added to specified dimensions where appropriate. Results of a recent inter-laboratory trial have been added to [Annex A](#).

To improve reproducibility, the following major modifications have been made from the previous version of this test method:

- a) The percentage minimum purity of the propane used has been provided (see [5.2](#));
- b) Two alternative methods for constructing the calorimeter are described with additional information on the figures; additional instructions are given for inserting the calorimeter into the mounting block; and the total mass of the calorimeter and mounting block is specified (see [5.3](#));
- c) Tolerances for the dimensions of machined parts have been added to text and drawings where required;
- d) Control of air movement during testing is specified (see [Clause 6](#));
- e) The specified relative humidity and temperature ranges for the conditioning and testing atmospheres have been changed (see [8.1](#) and [8.2](#));
- f) Additional procedures for calibration and stabilization of thermocouple temperature, including a procedure to check on the linearity of the thermocouple output during regulation of the incident heat flux density, have been added (see [9.1.1](#) and [9.1.2](#)); and
- g) Test report requirements have been revised (see [Clause 10](#)).

This corrected version of ISO 9151:2016 includes the following changes:

- in 5.3, second paragraph, the tolerance's value has been corrected from " ± 002 " to " $\pm 0,002$ ";
- in 9.3.3, second paragraph, the reference to [Annex A](#) has been corrected to [Annex B](#).

Introduction

Heat transmission through clothing is largely determined by its thickness including any air gaps trapped between adjacent layers. The air gaps can vary considerably in different areas of the same clothing assembly. The present method provides a grading of materials when tested under standard test conditions without an air gap.

Protective clothing against heat and flame — Determination of heat transmission on exposure to flame

1 Scope

This document specifies a method for determining the heat transmission through materials or material assemblies used in protective clothing. Materials may then be ranked by comparing heat transfer indices, which provide an indication of the relative heat transmission under the specified test conditions. The heat transfer index should not be taken as a measure of the protection time given by the tested materials under actual use conditions.

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 5725-2, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

IEC 60584-1, *Thermocouples — Part 1: Reference tables*

IEC 60584-3, *Thermocouples — Part 3: Extension and compensating cables — Tolerances and identification systems*

3 Terms and definitions

For the purposes of this document, the following definitions apply.

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

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

3.1

test specimen

all the layers of fabric or other materials arranged in the order and orientation as used in practice, including, where applicable, undergarment fabrics

3.2

incident heat flux

Q

amount of energy applied to the exposed face of the specimen, per unit time

Note 1 to entry: The unit is kW/m².