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# **Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces —**

## **Part 1: Hot surfaces**

*Ergonomie des ambiances thermiques — Méthodes d'évaluation de la  
réponse humaine au contact avec des surfaces —*

*Partie 1: Surfaces chaudes*



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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 13732-1 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 122, *Ergonomics*, in collaboration with Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 5, *Ergonomics of the physical environment*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

ISO 13732 consists of the following parts, under the general title *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces*:

- *Part 1: Hot surfaces*
- *Part 2: Human contact with surfaces at moderate temperature* [Technical Specification]
- *Part 3: Cold surfaces*

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## Introduction

When human skin comes into contact with a hot solid surface, burns may occur. Whether or not they do depends on a number of factors, the most important of which are

- the temperature of the surface,
- the material of the surface,
- the period of contact between the skin and the surface,
- the structure of the surface, and
- the sensitivity of the human being who comes into contact with the surface (e.g. child or adult).

Other factors can also play a part but are of minor importance. In Annex A the scientific background is presented and in the Bibliography publications concerning the objective are listed.

This part of ISO 13732 contains a collection of temperature threshold values for burns when the skin is in contact with a hot solid surface (Clause 4). It also contains a method for the assessment of the risk of burning, i.e. the application of the provided ergonomics data within a risk assessment procedure (Clause 5). A further application of the data may be the specification of temperature limit values for hot surfaces. Such temperature limit values may be specified in product standards or in regulations in order to prevent human beings sustaining a burn when in contact with the surface of a hot product. Guidance on how to select reasonable temperature limit values for that purpose is given in Clause 7. For different products with the same risk of burning it is reasonable to establish identical surface temperature limit values. Therefore, this part of ISO 13732 provides the possibility of harmonizing such temperature limit values for all kind of products.

Touching a hot surface may take place intentionally, e.g. to operate an electrically or gas powered machine or tool, or unintentionally, when a person is near a hot object. The period of contact with the hot surface will be different if the object is touched intentionally than if it is touched unintentionally. Considering human reaction times and their distribution in the population, 0,5 s is the minimum applicable contact period for unintentional touching of a hot surface for healthy adults on an acceptable safety level. For intentional touching the minimum applicable contact period will be longer. For the application of this part of ISO 13732, it is essential to select a contact period which best represents the real circumstances when a hot product is touched. Guidance for such selection is given in Annex B.

The ergonomics data provided in this part of ISO 13732 are mainly based on scientific research and represent, as far as is known, the behaviour of the human skin when in contact with a hot surface. Some of the data (e.g. burn threshold data for very short contacts of 0,5 s) are not directly based on scientific research but are deduced by extrapolation of the known threshold curves or by reasonable conclusion using scientific results.

The temperature threshold values provided in this part of ISO 13732 are valid for burning the skin when in contact with hot surfaces. For the time being there are not sufficient scientific data available on the effects of discomfort and pain to for them to be included in this part of ISO 13732. Some data for pain can be derived from national standards (see Annexes A and the Bibliography). Research projects are planned for obtaining data for discomfort and pain. When the results of these projects are available, this part of ISO 13732 may be revised in order to also include discomfort and pain temperature threshold values. ISO 13732-2 deals also with discomfort.

This part of ISO 13732 does not provide burn data on the skin that comes into contact with liquids or gases.

**NOTE** With the exception of water there are no such data available up to now. For water and liquids with similar heat capacity and heat flow properties burn threshold values for bare metals can be chosen.