

# SVENSK STANDARD

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**Ergonomi för termiskt klimat – Metoder för bedömning av reaktioner hos människan vid kontakt med ytor – Del 1: Varma ytor (ISO 13732-1:2006)**

**Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces (ISO 13732-1:2006)**



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Denna standard ersätter SS-EN ISO 13732-1:2006, utgåva 1.

The European Standard EN ISO 13732-1:2008 has the status of a Swedish Standard. This document contains the official English version of EN ISO 13732-1:2008.

This standard supersedes the Swedish Standard SS-EN ISO 13732-1:2006, edition 1.

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
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**EN ISO 13732-1**

September 2008

ICS 13.180

Supersedes EN ISO 13732-1:2006

English Version

**Ergonomics of the thermal environment - Methods for the  
assessment of human responses to contact with surfaces - Part  
1: Hot surfaces (ISO 13732-1:2006)**

Ergonomie des ambiances thermiques - Méthodes  
d'évaluation de la réponse humaine au contact avec des  
surfaces - Partie 1: Surfaces chaudes (ISO 13732-1:2006)

This European Standard was approved by CEN on 25 August 2008.

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## Foreword

The text of ISO 13732-1:2006 has been prepared by Technical Committee ISO/TC 159 "Ergonomics" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 13732-1:2008 by Technical Committee CEN/TC 122 "Ergonomics" the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 13732-1:2006.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EC Directive(s).

For relationship with EC Directive(s), see informative Annexes ZA and ZB, which are integral part of this document.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

### Endorsement notice

The text of ISO 13732-1:2006 has been approved by CEN as a EN ISO 13732-1:2008 without any modification.

**SS-EN ISO 13732-1:2008 (E)****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.



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

## Part 1: Hot surfaces

### 1 Scope

This part of ISO 13732 provides temperature threshold values for burns that occur when human skin is in contact with a hot solid surface.

It also describes methods for the assessment of the risks of burning, when humans could or might touch hot surfaces with their unprotected skin.

This part of ISO 13732 also gives guidance for cases where it is necessary to specify temperature limit values for hot surfaces; it does not set surface temperature limit values.

NOTE 1 Such temperature limit values can be specified in specific product standards or in regulations in order to prevent human beings sustaining burns when in contact with the hot surface of a product.

This part of ISO 13732 deals with contact periods of 0,5 s and longer.

It is applicable to contact when the surface temperature is essentially maintained during the contact (see 4.1).

It is not applicable if a large area of the skin (approximately 10 % or more of the skin of the whole body) can be in contact with the hot surface. Neither does it apply to skin contact of more than 10 % of the head or contact which could result in burns of vital areas of the face.

NOTE 2 In some cases, the results of contact with a hot surface can be more serious for the individual, for example:

- burns resulting in the restriction of airways;
- large burns (more than 10 % of the body surface) that can impair the circulation by fluid loss;
- heating of a large proportion of the head or whole body that could lead to unacceptable heat strain even in the absence of burning.

This part of ISO 13732 is applicable to the hot surfaces of all kind of objects: equipment, products, buildings, natural objects, etc. For the purposes of simplification, it mentions only products; nevertheless, it applies to all other objects as well.

It is applicable to products used in any environment, e.g. in the workplace, in the home.

It is applicable to hot surfaces of products that may be touched by healthy adults, children, elderly people and also by people with physical disabilities.

It does not provide data for the protection against discomfort or pain.

**SS-EN ISO 13732-1:2008 (E)****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).

ISO 7726:1998, *Ergonomics of the thermal environment — Instruments for measuring physical quantities*

**3 Terms and definitions**

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

**3.1 touchable surface**

surface of a product that can be touched by a person's skin

**3.2 surface temperature**

$T_s$   
temperature of a material's surface

NOTE Surface temperature is expressed in degrees Celsius (°C).

**3.3 contact period**

$D$   
duration of contact of the skin with the surface

NOTE Contact period is expressed in seconds (s).

**3.4 thermal inertia**

product of density ( $\rho$ ), thermal conductivity ( $K$ ) and specific thermal capacity ( $c$ ) of a material

**3.5 burn threshold**

surface temperature defining the boundary between no burn and a superficial partial thickness burn, caused by contact of the skin with this surface for a specified contact period

NOTE Burns are classified into three levels, depending on severity.

— superficial partial thickness burn:

in all but the most superficial burns, the epidermis is completely destroyed but the hair follicles and sebaceous glands as well as the sweat glands are spared.

— deep partial thickness burn:

a substantial part of the dermis and all sebaceous glands are destroyed and only the deeper parts of the hair follicles or the sweat glands survive.

— whole thickness burn:

the full thickness of the skin is destroyed and there are no surviving epithelial elements.

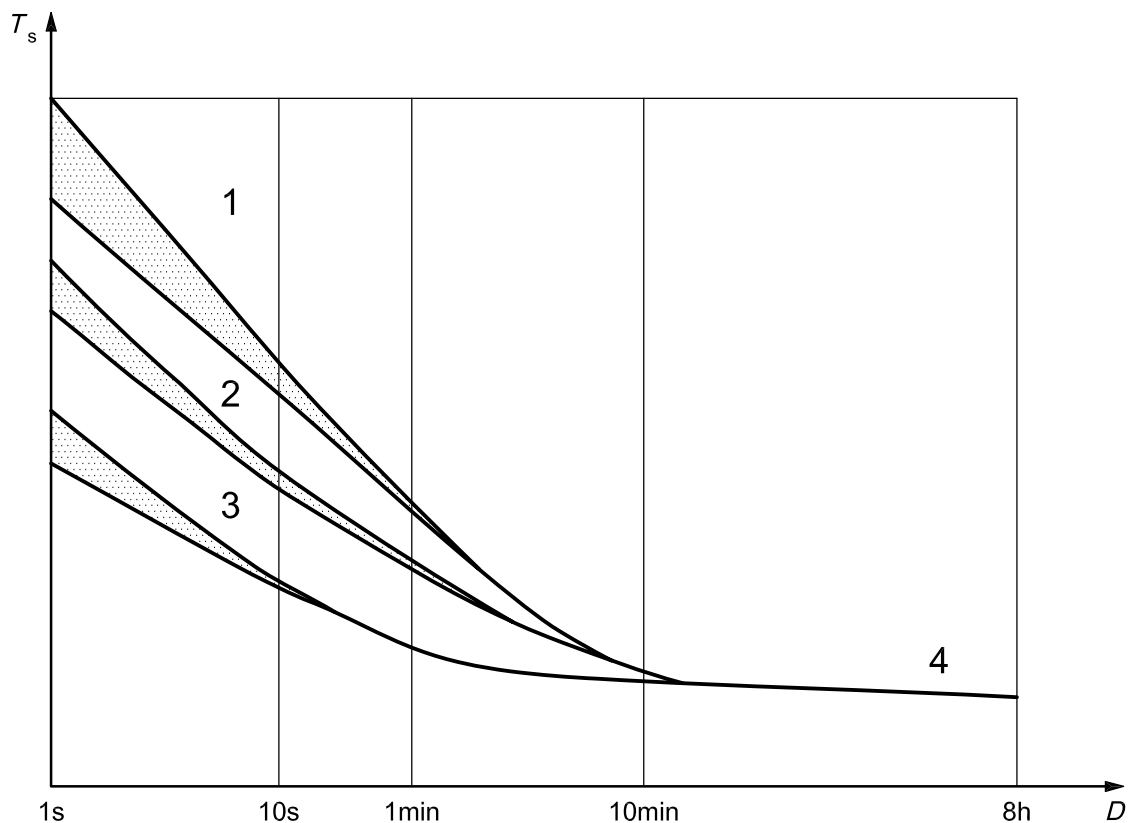
## 4 Burn thresholds

### 4.1 General

This clause provides surface temperature data for burn thresholds.

NOTE The occurrence of burning depends on the temperature of the skin and on the period of raised skin temperature. The connection between skin temperature, the period of its influence and occurrence of burning has been scientifically studied and is known (see Annex A). But it is not practicable by simple means to measure the temperature of the skin during its contact with the hot surface of a product. Therefore, in this part of ISO 13732 it is not the temperature values of the skin which are specified but the temperature values of hot surfaces of products which, when in contact with the skin, lead to burns (the burn thresholds). The temperature of a surface of a product is simply measurable by appropriate measuring facilities.

The surface temperatures which lead to burns during contact of the skin with a hot product depend on the material of which the product consists, and on the period of the contact of the skin with the surface. This relationship is presented in Figure 1, which shows this relationship for several groups of materials which have similar heat conductivity properties and therefore similar burn thresholds.



#### Key

- $D$  contact period
- $T_s$  surface temperature
- 1 plastics
- 2 ceramics
- 3 metals
- 4 burn threshold

**Figure 1 — Illustration of general relationship between burn threshold and contact period when hot surface is touched by skin**