

**Soojuskeskkondade ergonoomika. Meetodid,  
millega hinnata inimese reaktsiooni kokkupuutel  
pinnaga. Osa 3: Külmad pinnad**

Ergonomic of the thermal environment - Methods for  
the assessment of human responses to contact with  
surfaces - Part 3: Cold surfaces

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN ISO 13732-3:2008 sisaldab Euroopa standardi EN ISO 13732-3:2008 ingliskeelset teksti.</p> <p>Standard on kinnitatud Eesti Standardikeskuse 15.12.2008 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.</p> <p>Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 10.09.2008.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN ISO 13732-3:2008 consists of the English text of the European standard EN ISO 13732-3:2008.</p> <p>This standard is ratified with the order of Estonian Centre for Standardisation dated 15.12.2008 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.</p> <p>Date of Availability of the European standard text 10.09.2008.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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**Võtmesõnad:** area, human factors engineering, mathematics, operating stations, tempera, temperature limit, thermal comfort, thermal environment, thermal environment systems, thermal properties, threshold value, touching, use, working places, workplace safety

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English Version

**Ergonomics of the thermal environment - Methods for the  
assessment of human responses to contact with surfaces - Part  
3: Cold surfaces (ISO 13732-3:2005)**

Ergonomie des ambiances thermiques - Méthodes  
d'évaluation de la réponse humaine au contact avec des  
surfaces - Partie 3: Surfaces froides (ISO 13732-3:2005)

Ergonomie der thermischen Umgebung -  
Bewertungsmethoden für Reaktionen des Menschen bei  
Kontakt mit Oberflächen - Teil 3: Kalte Oberflächen (ISO  
13732-3:2005)

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

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## Foreword

The text of ISO 13732-3:2005 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 13732-3:2008 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 13732-3:2005.

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 13732-3:2005 has been approved by CEN as a EN ISO 13732-3:2008 without any modification.

## Annex ZA (informative)

### Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 98/37/EC on machinery, amended by 98/79/EC.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

**Table ZA.1 — Correspondence between this European Standard and Directive 98/37/EC,  
amended by 98/79/EC**

Clause(s)/sub-clause(s) of this EN	Essential Requirements (ERs) of Directive 98/37/EC, amended by 98/79/EC	Qualifying remarks/Notes
Clauses 4 to 8	1.1.5, 1.5.5, 1.7.2	-

**WARNING —** Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

## Annex ZB (informative)

### Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC on machinery.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard given in Table ZB.1 confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

**Table ZB.1 — Correspondence between this European Standard and Directive 2006/42/EC**

Clause(s)/sub-clause(s) of this EN	Essential Requirements (ERs) of Directive 2006/42/EC	Qualifying remarks/Notes
All clauses	Annex I: 1.1.6, 1.5.5, 1.7.2	-

**WARNING** — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

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## Introduction

This European Standard is a type B standard as stated in EN ISO 12100. The provisions of this document may be supplemented or modified by a type C standard.

**NOTE** For machines which are covered by the scope of a type C standard and which have been designed and built according to the provisions of that standard, the provisions of that type C standard take precedence over the provisions of this type B standard.

Working with unprotected hands is often inevitable in the cold operation when a precision task is demanded. However the contact of bare skin with cold surfaces reduces skin temperature, causing acute effects such as discomfort, pain, numbness or frostbite. In addition repeated cold exposures with severe cooling of the skin may induce non-freezing cold injury (possible damage of nerves or vessels). Although the existing international standards are at hand for the assessment of the cold hazards involved, no standard concerns the special problems of contacting cold surfaces so far. Assessment of contact cooling is thus considered necessary.

To assess the risk of the cold injury, it is necessary to know the major factors affecting principally hand/finger cooling on cold surfaces. These factors involve:

- properties of the object surface;
- temperature of the cold surface and ambience;
- duration of contact between the skin and the surface;
- characteristics of hand/finger skin and the type and nature of the contact.

In practice, these factors are somewhat interacted and complicated. The type of contact material has an impact on the contact time at various cold temperatures. Thus, the contact time for the critical contact temperature limits on cold surfaces were empirically correlated with the major factors such as thermal penetration coefficient and surface temperature of the material, respectively. The statistically non-linear models (empirical models) based on the database of lower quartile (75 % protected) are able to estimate the finger/hand contact cooling of a large range of individuals on the cold surfaces.

This European Standard is designed to integrate all results obtained from the experimental research with both human fingers and an artificial finger. It outlines a guideline document for the specification of safe time limits of hand/finger contact with various cold surfaces.



## 1 Scope

This European Standard describes methods for the assessment of the risk of cold injury and other adverse effects when a cold surface is touched by bare hand/finger skin.

This standard provides ergonomics data to establish temperature limit values for cold solid surfaces. The values established can be used in the development of special standards, where surface temperature limit values are required.

The data of this standard will be applicable to all fields where cold solid surfaces cause a risk of acute effects: pain, numbness and frostbite.

The data are not limited to the hands but apply to human skin in general.

The standard is applicable to the healthy skin of adults (females and males). Considerations on the extension of applications are given in Annex B.

## 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.

EN ISO 12100-1:2003, *Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100-1:2003 and the following apply.

### 3.1

#### **touchable surface**

surface of a product, which can be touched by a person

### 3.2

#### **surface temperature**

$T_s$

temperature of a material surface in °C

### 3.3

#### **critical contact temperature**

$T_c$

contact temperature at which defined skin response criteria are elicited in °C

### 3.4

#### **contact period**

$D$

duration during which contact of the skin with the surface takes place in s

### 3.5

#### **thermal inertia**

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