



# SLOVENSKI STANDARD oSIST prEN 16422:2023

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## Klasifikacija termoregulacijskih lastnosti

Classification of thermoregulatory properties

Klassifizierung von thermoregulierenden Eigenschaften

Classification des propriétés thermorégulantes

Ta slovenski standard je istoveten z: prEN 16422

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<https://standards.sist/1815243b-05add490d7bc/osist-pren-16422-2023> Textile fabrics

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## Classification of thermoregulatory properties

Classement des propriétés de thermorégulation

Klassifizierung von thermoregulierenden  
Eigenschaften

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 248.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

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**prEN 16422:2023 (E)****European foreword**

This document (prEN 16422:2023) has been prepared by Technical Committee CEN/TC 248 “Textiles and textile products”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This document will supersede CEN/TR 16422:2012.

EN 16422:2023 includes the following significant technical changes with respect to CEN/TR 16422:2012:

- updated normative references and move of all normative references into the Bibliography;
- informative Annex A becomes normative;
- informative Annex B has been replaced by an informative reference to EN 17534;
- informative references to manikin standards EN ISO 15831 and EN 17528 added;
- editorial changes were made throughout the document to bring it up-to-date.

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## Introduction

This document has been developed to help retailers, manufacturers and consumers with the evaluation of thermoregulatory properties of textiles, and selection of the most appropriate methods to define their individual material performance requirements.

In order to encourage the use of the widest possible selection of materials and technologies, this document takes the form of advice and guidance on the tests or groups of tests which would verify the defined performance characteristics of a material or a product composite. It summarizes the scope and application of the test described and provides an indication of suggested range of results for the referred test method or methods to allow the user to grade performance of the material under evaluation. Where a choice of test methods is available for measuring the same parameter on a material, each is described to allow the user of this document to select the most appropriate method for his/her requirements.

This document also introduces a system of three performance levels for the different thermoregulatory properties:

- thermal insulation;
- water vapour transmission (breathability);
- air permeability;
- water penetration resistance and repellence;
- liquid sweat management.

The large differences in the conditions of use necessitate a flexible use of the properties and performance levels. This allows a choice of the appropriate level for each property and so to compose a 'product profile', adapted to each specific type of use. There is for example, a significant difference between thermoregulatory properties required for outerwear clothing for cool, windy and rainy weather during low activity, and socks for warm indoor use during intense physical or sport activity. In addition, the work clothing for a shop assistant requires different properties of thermoregulation than the underwear intended for skiing, or home wear for the elderly. The ambient temperature, ambient moisture, wind and level of activity, the contact to skin or other layers of clothing influence the requirements. <https://pre-n-16422-2023>

At the point of issue, it is recognized that the industry is in a constant state of development with regard to new technology for innovative fibres and performance applications, and that methods required to evaluate these new technologies can in the future be different to those in this document. Subsequent revisions will consider the addition of any new test methods required to keep advice current to the industry and its changing needs.

This document includes an Annex A. In this Annex A, there is consideration for product design and use situations, as material performance is not the sole contributory factor to the thermoregulatory performance of the final product or ensemble in use. This Annex A also has examples of marking products.

## prEN 16422:2023 (E)

### 1 Scope

This document specifies test methods available for the measurement of thermoregulatory properties of textile materials for use in clothing and gives guidance on the most suitable methods for selection where choices are available to the user.

This document also establishes classification of the thermoregulatory properties in three performance levels.

This document does not apply to the thermoregulatory properties of Personal Protective Equipment (PPE) and clothing items or textile products for which a standard already specifies a particular requirement.

This document does not apply also to heated textile, phase change materials (PCM) and similar smart materials for thermoregulation, for which CEN ISO/TR 23383 can give better guidance.

### 2 Normative references

There are no normative references in this document.

### 3 Terms and definitions

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

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

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

#### 3.1

##### **thermoregulatory properties**

properties of textiles which influence the thermoregulation of the human body to maintain the core body temperature at a stable and comfortable state

Note 1 to entry: The properties are thermal insulation, water vapour transmission (breathability), air permeability, water penetration resistance and repellence and liquid sweat management.

#### 3.2

##### **thermal insulation (resistance)**

###### **$R_{ct}$**

quantity specific to textile materials or composites which determines the dry heat flux between the two faces of a material related to area and temperature gradient, expressed in square metres Kelvin per watt ( $\text{m}^2 \text{K/W}$ )

Note 1 to entry: The dry heat flux consists of one or more conductive, convective and radiant components.

#### 3.3

##### **water vapour transmission (breathability)**

###### **WVT**

ability of the fabric to transport water vapour expressed either as an absolute value by the water vapour resistance  $R_{et}$ , by the water vapour permeability WVP, or by the relative value related to thermal insulation by the water vapour permeability index  $i_{mt}$



**3.4****water vapour resistance** **$R_{et}$** 

quantity specific to textile materials and composites, which determines the 'latent' evaporative heat flux between the two faces of a material related to area and water vapour pressure gradient, expressed in square metres pascal per watt ( $m^2 Pa/W$ )

Note 1 to entry: The evaporative heat flux consists of both diffusive and convective components.

**3.5****water vapour permeability index** **$i_{mt}$** 

transport properties related to thermal insulation expressed by an index between 0 and 1

**3.6****water vapour permeability****WVP**

rate of water vapour transmission expressed in grams per square metre hour pascal ( $g/(m^2 Pa h)$ )

**3.7****air permeability****AP**

volume of air passing perpendicularly through a test specimen under specified conditions of test area, pressure difference and time

**3.8****water penetration resistance****WP**

resistance to the penetration of water through the material under a specific hydrostatic pressure

**3.9****water repellence**

ability of fabric to resist surface wetting by water

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**3.10****liquid sweat management**

combining of uptake or buffering of the sweat from the skin, on one hand, and on the other hand, sweat transport from the skin to the ambience

[SOURCE: EN 17534:2022, definition 3.3]

**3.11****skin contact products**

fabrics or garments intended primarily to be worn next to the skin

Note 1 to entry: Typical examples are underwear, t-shirts, shirts, blouses, trousers, nightwear.

**3.12****second layer or intermediate layer products**

fabrics or garments intended to be worn above the skin contact products and beneath the outer layer products

Note 1 to entry: Typical examples are sweaters, shirts, vests, blouses.

**prEN 16422:2023 (E)****3.13****outer layer products**

fabrics or garments intended to be worn outermost of the layer of clothing, primarily outdoors

Note 1 to entry: Typical examples are overcoats, jackets, trousers, overalls, rainwear.

**4 Test methods****4.1 Thermal insulation****4.1.1 General**

For the purposes of this document, two EN or ISO test methods have been identified for the measurement of thermal insulation. Both test methods give the thermal insulation value in  $\text{m}^2 \text{K/W}$ , and the results from the two tests are comparable.

**4.1.2 ISO 5085-1, Textiles – Determination of thermal resistance – Part 1: Low thermal resistance****4.1.2.1 Scope**

The standard specifies a method for the determination of the resistance of fabrics, fabric assemblies, or fibre aggregates in sheet form to the transmission of heat through them in the 'steady-state' condition. It applies to materials whose thermal resistance is up to approximately  $0,2 \text{ m}^2 \text{K/W}$ .

The method is only suitable for materials of up to 20 mm thickness (if the material is thicker, lateral edge losses are more substantial).

**4.1.2.2 Principle**

The temperature drop across a material of known thermal resistance and across a specimen of the material under test in series with it are measured, and from the values obtained, the thermal resistance of the specimen is determined.

**4.1.2.3 Application**

Two methods are specified in the standard (single and double plate methods). In the context of this Standard, the single plate method shall be used.

**4.1.3 EN ISO 11092 (ISO 11092), Textiles – Determination of physiological effects – Measurement of thermal and water-vapour resistance under steady-state conditions (sweating guarded-hotplate test)****4.1.3.1 Scope**

The standard specifies test methods for the measurement of the thermal resistance and water vapour-resistance of fabrics, under steady-state conditions.

The application of this measurement technique is restricted to a maximum thermal resistance which depends on the dimensions and construction of the apparatus used, for the minimum specifications of the equipment referred to in this international standard. This value is  $2 \text{ m}^2 \text{K/W}$ .

The test conditions used in this standard are not intended to represent specific comfort situations, and performance specifications in relation to physiological comfort are not stated.

**4.1.3.2 Principle**

The specimen to be tested is placed on an electrically heated plate with conditioned air ducted to flow across and parallel to its upper surface as specified in this International Standard.