

ICS 59.080.30

English Version

Classification of thermoregulatory properties

Classement des propriétés de thermorégulation

Klassifizierung von thermoregulierenden Eigenschaften

This Technical Report was approved by CEN on 27 August 2012. It has been drawn up by the Technical Committee CEN/TC 248.

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Foreword

This document (CEN/TR 16422:2012) has been prepared by Technical Committee CEN/TC 248 “Textiles and textile products”, the secretariat of which is held by BSI.

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Introduction

This Technical Report 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 report 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 summarises 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 are available for measuring the same parameter on a material, each is described to allow the user of the standard to select the most appropriate method for his requirements.

This report introduces also 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.

At the point of issue, it is recognised 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 may in the future be different to those in this report. 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 annexes. In 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 also has examples of marking products. Annex B specifies two alternative methods for liquid sweat transport and liquid sweat buffering.

1 Scope

This Technical Report outlines test methods available for the measurement of thermoregulatory properties of textile materials for use in clothing, and provides guidance on the most suitable methods for selection where choices are available to the user.

The document also provides classification of the thermoregulatory properties in three performance levels.

This Technical Report excludes consideration for the thermoregulatory properties of Personal Protective Equipment (PPE) and clothing items or textile products for which a standard already specifies a particular requirement.

This Technical Report excludes also phase change materials (PCM) and similar smart materials for thermoregulation, for which CEN/TR 16298 may give better guidance.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 24920, *Textiles – Determination of resistance to surface wetting (spray test) of fabrics*

EN 29865, *Textiles – Determination of water repellency of fabrics by the Bundesmann rain-shower test*

EN 31092, *Textiles – Determination of physiological effects – Measurement of thermal and water-vapour resistance under steady-state conditions (sweating guarded-hotplate test)*

EN ISO 9237, *Textiles – Determination of permeability of fabrics to air (ISO 9237)*

EN 20811, *Textiles – Determination of resistance to water penetration – Hydrostatic pressure test.*

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

AATCC TM 195, *Liquid moisture management properties of textile fabrics*

3 Terms and definitions

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

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}

a 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 ($m^2 \cdot K/W$).

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