

ICS 59.080.80

Quantitative Messung der Verdunstungskühlung von smarten textilen Materialien für Arbeit, Sport / Outdoor und Freizeit; Text Englisch

Quantitative measurement of the evaporative heat loss of smart textile materials for work, sports / outdoor and leisure; Text in English

Mesure quantitative de la perte de chaleur par l'évaporation dans les textiles intelligents pour le travail, les sports et les loisirs; Texte en anglais

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Das vorliegende Dokument wurde nach den Verfahrensregeln einer PAS erstellt.

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Dieses Dokument wurde durch die im Vorwort genannten Verfasser erarbeitet und verabschiedet.

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Foreword

This DIN SPEC has been developed according to the PAS procedure. The development of a DIN SPEC according to the PAS procedure is carried out in workshops and does not require the participation of all stakeholders.

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At present, there are no standards covering this topic in the body of German Standards.

DIN SPEC (PAS) are not part of the body of German Standards.

A draft of this DIN SPEC (PAS) has not been published.

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For international standards cited in this document, reference is made in the following to the corresponding German standards.

ISO 15831:2004	see DIN EN ISO 15831:2004-05
ISO 105-C08	see DIN EN ISO 105-C08
ISO 6330	see DIN EN ISO 6330
ISO 11092	see DIN EN ISO 11092
CEN/TR 16422:2012	see DIN CEN/TR 16422 (DIN SPEC 19270):2013-03

Introduction

Under hot and humid conditions, the most effective way to lose heat is the evaporation of sweat. This is necessary for the human body not to suffer from hyperthermia. Apparel influences this evaporative heat loss by its sweat management properties. On the one hand apparel is an extra resistance to water vapour. On the other hand, it can spread liquid water to a greater surface area, what is often called “wicking” and therefore enhance evaporation. But in the end the question is, how much heat is lost by evaporation with the same amount of sweat depending on the clothes worn.

NOTE Further and Future applications see Annex A and B.

1 Scope

This DIN SPEC shall determine measurement methods and requirements for textile materials resp. apparel (esp. close/tight-fitting performance shirts, T-shirts, polos, shirts) which are worn at work, sports/outdoor and leisure with the purpose of persistent physical/thermophysiological cooling (evaporative cooling) on the wearer at high physical workload and/or high ambient temperatures.

This DIN SPEC excludes textile materials with only sensorial cooling (chemical stimulation of the cold receptors in the human skin) — therefore no physical draw of excess body heat.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 15831:2004, *Clothing — Physiological effects — Measurement of thermal insulation by means of a thermal manikin*

ISO 105-C08, *Textiles — Tests for colour fastness — Part C08: Colour fastness to domestic and commercial laundering using a non-phosphate reference detergent incorporating a low-temperature bleach activator*

ISO 6330, *Textiles — Domestic washing and drying procedures for textile testing*

ISO 11092, *Textiles — Physiological effects — Measurement of thermal and water-vapour resistance under steady-state conditions (sweating guarded-hotplate test)*

CEN/TR 16422:2012, *Classification of thermoregulatory properties*

3 Terms and definitions

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

DIN and DKE provide terminological databases for uses in standardization at the following addresses:

- DIN-TERMinologieportal: available at <https://www.din.de/go/din-term>
- DKE-IEV: available at <http://www.dke.de/DKE-IEV>

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

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

3.1

evaporative heat loss

evaporative cooling

heat that is drawn out of the human body by evaporation of sweat (i.e. water)

3.2

ambient climate

temperature and relative humidity under which the test is conducted

3.3

environmental conditions

air movement and additional radiative heat load

Note 1 to entry: Meant is wind and sun i.e. solar radiation. Wind in m/s and solar radiation simulated by Infrared (IR) radiation in W.

3.4

sweat rate

amount of deionized water in g/h that is supplied to the measuring head of the testing device via nozzles/sweat glands during a test run utilizing a peristaltic pump

3.5

wicking power

P_{wicking}

how fast a fabric adsorbs and distributes the moisture/sweat making it available for evaporative cooling

3.6

cooling power

P_{cooling}

evaporative heat loss in W achieved in the steady state condition during the last 10 min of the sweating phase which represents the evaporative heat loss/cooling of the fabric at the end of maximum moisture exposure in the steady state

3.7

drying time

t_{drying}

time period from when the introduction of moisture stops until the heat loss returns to the level (i.e. heating power) of the dry fabric prior to moisture introduction

Note 1 to entry: I.e. after the supply of external water was stopped until the fabric is dry.

3.8

cooling time

t_{cooling}

time period during which evaporative cooling is happening after the supply of external water was stopped until the fabric is dry

Note 1 to entry: Refers to sport medical applications.

3.9

Fabric Cooling Efficiency Index

I_{FCE}

achieved evaporative heat loss in steady state levelled to the weight of the fabric

Note 1 to entry: The higher the number, the more efficient the fabric is able to evaporate the water (degree of evaporative cooling efficiency).

3.10

thermal barrier index

identifying the weight of the fabric and its related dry thermal resistance (R_{ct})

Note 1 to entry: Each tested fabric is thereby assigned to a defined category of comparable fabrics.