SLOVENSKI STANDARD
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Varovalna obleka - Oblačila za zaščito v hladnih okoljih

Protective clothing - Garments for protection against cool environments

Schutzkleidung - Kleidungsstücke zum Schutz gegen kühle Umgebungen

Vêtements de protection - Articles d'habillement de protection contre les environnements frais

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Protective clothing - Garments for protection against cool environments

Vêtements de protection - Articles d'habillement de protection contre les environnements frais

Schutzkleidung - Kleidungsstücke zum Schutz gegen kühle Umgebungen

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COMITÉ EUROPÉEN DE NORMALISATION
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European Foreword

This document (prEN 14058:2016) has been prepared by Technical Committee CEN/TC 162 “Protective clothing including hand and arm protection and lifejackets”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 14058:2004.

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 EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

Introduction

In many cases single garments are placed on the market to protect against local body cooling (for ensembles see EN 342). These garments can be e. g. waistcoats, jackets, coats or trousers and/or separable thermal linings. They can provide a certain degree of protection to cool environment for a certain length of time, depending e. g. on the personal constitution and activity, the accompanying clothing and the environmental features (wind speed, temperature, humidity). The more dangerous the situation (e. g. low effective temperature, long exposure duration, no help nearby) the more important it is to assess the cold protection properties of the garment (see Annex B), especially if the user cannot safely identify the risk at low temperature in an appropriate time.

At moderate low temperatures (e. g. between -5 °C and +15 °C) garments against local body cooling are not only used for outdoor activities e. g. in construction industry but can be used for indoor activities e. g. in food processing industry. In these cases garments often do not need to be made of watertight or air impermeable materials. Therefore, in this European Standard, these requirements are applicable if the manufacturer claims in his instructions for use protection for hazards covered by these properties.

The resultant effective thermal insulation value I_{cler} can be used to assess temperature ranges according to Tables B.1 and B.2.

1 Scope

This document specifies requirements and test methods for the performance of clothing ensembles (e. g. two piece suits or coveralls) and of single garments for protection against the effects of cool environments (see Annex B).

Requirements and test methods of garments for protection against cold environments are specified in EN 342. It does not include specific requirements for headwear or footwear or gloves to prevent local cooling.

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 342:2004, *Protective clothing — Ensembles and garments for protection against cold*

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

EN ISO 3175-1, *Textiles — Professional care, drycleaning and wetcleaning of fabrics and garments — Part 1: Assessment of performance after cleaning and finishing (ISO 3175-1)*

EN ISO 5077, *Textiles — Determination of dimensional change in washing and drying (ISO 5077)*

EN ISO 9237:1995, *Textiles — Determination of permeability of fabrics to air (ISO 9237:1995)*

EN ISO 4674-1, *Rubber- or plastics-coated fabrics — Determination of tear resistance — Part 1: Constant rate of tear methods (ISO 4674-1)*

EN ISO 11092:2014, *Textiles — Physiological effects — Measurement of thermal and water-vapour resistance under steady-state conditions (sweating guarded-hotplate test) (ISO 11092:2014)*

EN ISO 13688, *Protective clothing — General requirements (ISO 13688)*

EN ISO 13938-1, *Textiles — Bursting properties of fabrics — Part 1: Hydraulic method for determination of bursting strength and bursting distension (ISO 13938-1)*

EN ISO 13938-2, *Textiles — Bursting properties of fabrics — Part 2: Pneumatic method for determination of bursting strength and bursting distension (ISO 13938-2)*

EN ISO 15831, *Clothing — Physiological effects — Measurement of thermal insulation by means of a thermal manikin (ISO 15831)*

ISO 7000, *Graphical symbols for use on equipment — Registered symbols*

3 Terms and definitions

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

3.1
cool environment
environment characterized by the combination of humidity and wind at air temperatures above -5 °C (including wind-chill effect)

3.2
garment
individual component of a clothing ensemble covering a part of the body, the wearing of which provides protection against hypothermia and/or local cooling

3.3
ensemble
clothing consisting of a two-piece suit or one-piece suit (coverall) or a number of garments covering the body, except head, hands and feet and providing protection against hypothermia

3.4
thermal lining
non-watertight layer providing thermal insulation

3.5
thermal resistance (insulation) R_{ct}
temperature difference between the two faces of a material divided by the resultant heat flux per unit area in the direction of the gradient

[SOURCE: EN ISO 11092:2014, 2.1]

Note 1 to entry: It is a quantity specific to textile materials or composites which determine the dry heat flux across a given area in response to a steady applied temperature gradient. The dry heat flux may consist of one or more conductive, convective and radiant components.

Note 2 to entry Thermal resistance is expressed in square metres kelvin per watt.

3.6
water vapour resistance R_{et}
water-vapour pressure difference between the two faces of a material divided by the resultant evaporative heat flux per unit area in the direction of the gradient

[SOURCE: EN ISO 11092:2014, 2.2]

Note 1 to entry: It is a quantity specific to textile materials or composites, which determines the "latent" evaporative heat flux across a given area in response to a steady applied water-vapour pressure gradient. The evaporative heat flux may consist of both diffusive and convective components.

Note 2 to entry: Water-vapour resistance is expressed in square metres pascal per watt.

3.7
resultant effective thermal insulation I_{cler}
thermal insulation from skin to outer clothing surface under defined conditions measured with or calculated for a moving manikin determined in relation to the naked body surface area

Note 1 to entry: I_{cler}, is expressed in m^2 K/W.

3.8
insulation required *IREQ*
required resultant thermal insulation calculated on the basis of the thermal parameters of the environment (e. g. air temperature, mean radiant temperature, air velocity, relative humidity) and the body metabolism

[SOURCE: EN ISO 11079:2007, 3.1.3]

3.9
resistance to water penetration *WP*
hydrostatic pressure supported by a material is a measure of the opposition to the passage of water through material

Note 1 to entry: The value is expressed in Pa.

3.10
air permeability
velocity of an air flow passing perpendicularly through a test specimen under specified conditions of test area, pressure drop and time

[SOURCE: EN ISO 9237:1995, 3.1]

Note 1 to entry: *AP* is expressed in mm/s.

4 Performance assessment and requirements

4.1 Ergonomics and innocuousness

When tested in accordance with 6.1 the requirements of EN ISO 13688 shall be met in regard to innocuousness and ergonomics. Additionally the following requirements shall apply as well:

The jacket/coat or coverall shall be closable up to the collar or neckband and shall be long enough to cover the tops of the trousers even when the wearer is bending over.

External pockets on jackets and coveralls intended to be used in wet conditions (see 4.4) shall be closable.

Closures, such as slide fasteners, fasteners, buttons etc. shall not be opened when wearing the garment under foreseeable conditions and duration. Slide fasteners shall lock when completely closed.

NOTE Waistcoats can be lengthened at the back to protect the kidney region against the effects of cold.

4.2 Thermal Resistance, R_{ct}

When tested in accordance with 6.2 the thermal resistance R_{ct} of all layers of the garment shall be in accordance with Table 1.

Table 1 — Classification of thermal resistance R_{ct}

R_{ct} $m^2 \cdot K/W$	Class
$0,06 \leq R_{ct} < 0,12$	1
$0,12 \leq R_{ct} < 0,18$	2
$0,18 \leq R_{ct} < 0,25$	3
$0,25 \leq R_{ct}$	4

NOTE The maximum level of protection is given when the thermal insulation is adapted to the ambient temperature and the activity level (Examples are given in Annex B). In this case the wearer is in a thermally neutral state. A too high thermal insulation leads to excessive sweating and wetting the garments. As a consequence the effective thermal insulation of the garment is lowered.

Garments containing materials with a thermal resistance above 0,25 m^2 K/W might be intended for use in cold environments and therefore shall be assessed according to 4.6.

If the I_{cler} value is above 0,265 m^2 K/W the product shall comply with EN 342.

4.3 Air permeability, *AP*

When tested in accordance with 6.4 the air permeability shall be in accordance with Table 2, if the garment is intended to be used not only indoor according to the manufacturer's information.

Table 2 — Classification of air permeability *AP*

AP mm/s	**Class**
$100 < AP$	1
$5 < AP \leq 100$	2
$AP \leq 5$	3

Class 1 material layers of a garment should be considered as appropriate for low air velocities of less than 1 m/s as e. g. in cold indoor environments. Class 2 materials should be appropriate for air velocities of less than 5 m/s; Class 3 materials are appropriate for high air velocities as e. g. common in outdoor activities.

4.4 Resistance to water penetration, *WP*

If the manufacturer claims in his information leaflet a resistance to water penetration, the garment shall be tested according to 6.5 with a minimum value of 8 000 Pa.

4.5 Water vapour resistance, R_{et}

If protection against water penetration is required as in 4.4, the water vapour resistance R_{et} shall be measured in accordance with 6.3. The water vapour resistance R_{et} of the combination of all layers of the garment together (without underwear) shall be less than 55 m^2 Pa/W.

4.6 Resultant effective thermal insulation, I_{cler}

If R_{ct} is equal or larger than 0,25 m^2 K/W the resultant effective thermal insulation measured according to 6.6 is required and shall have a minimum value of 0,174 m^2 K/W.

$$I_{cler} = I_{tr} - I_{ar} \quad (1)$$

where

I_{tr} is the resultant total thermal insulation from skin to ambient atmosphere, including clothing and boundary air layer, measured with a moving manikin under the conditions defined in EN ISO 15831 in m^2K/W;

I_{ar} is the thermal insulation of the boundary air layer, measured with a moving manikin in m^2K/W.

For temperature ranges of utility of the garment ensemble considering wearing time and wind speed, see Annex B.