SLOVENSKI STANDARD
SIST EN 342:2018

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SIST EN 342:2004
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Varovalna obleka - Oblačila in kompleti za zaščito pred mrazom

Protective clothing - Ensembles and garments for protection against cold

Schutzkleidung - Kleidungssysteme und Kleidungsstücke zum Schutz gegen Kälte

Vêtements de protection - Ensembles vestimentaires et articles d'habillement de protection contre le froid

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13.340.10	Varovalna obleka	Protective clothing

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Protective clothing - Ensembles and garments for protection against cold

Vêtements de protection - Ensembles vestimentaires et articles d'habillement de protection contre le froid

Schutzkleidung - Kleidungssysteme und Kleidungsstücke zum Schutz gegen Kälte

This European Standard was approved by CEN on 4 September 2017.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 342:2017) 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 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of an identical text or by endorsement, at the latest by May 2018, and conflicting national standards shall be withdrawn at the latest by May 2018.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 342:2004.

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 Annexes ZA and ZB, which are an integral part of this document.

Regarding the most significant changes that have been made in this new edition, see Annex A.

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, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document is published to achieve a common basis in Europe for requirements and test methods for protective clothing ensembles and garments against cold in the interest of manufacturers, test institutes and end-users. The measured properties and their subsequent classification are intended to ensure an adequate protection level under different user conditions. Thermal insulation of the ensemble or garment and the air permeability are the essential properties to be tested and marked on the label.

Thermal insulation is the most important property and it is measured by using a full-sized thermal manikin with the ensemble or garment and accompanying standard clothing in order to account for the effect of layers, fit, drape, coverage and shape.

In this respect this standard differs from many other standards specifying only material properties. The insulation is tested with complete ensembles and garments after a defined pretreatment ensuring that processing the garment considers mechanical aspects making tests like flexibility or abrasion unnecessary. It should be recognized that ensembles and garments in frequent use can lose significant insulation capacity due to laundering and wear. In general high quality products and well maintained clothing are less affected in this respect.

Wind can considerably increase convective heat losses. Therefore, the air permeability of the outer garment material is an important factor to be taken into account in relation to the protection of the wearer against cold.

In cold conditions as defined by the standard the possible exposure to water is seldom and considered to be limited, therefore this standard contains only optional requirements to water penetration. In case the exposure to water is not limited, EN 343 applies.

The resultant effective thermal insulation value I_{cler} can be used to assess temperature ranges according to Tables C.1 and C.2. This guidance information for the selection of the appropriate cold protective garment(s) is one of the benefits, if the resultant effective thermal insulation value I_{cler} of the garment(s) has been measured on a thermal manikin.

Sweating should be avoided in continuous cold exposure, since moisture absorption will progressively reduce insulation. This is best controlled by selecting optimal rather than maximal insulation and flexible, adjustable garments rather than fixed and closed ensembles. It is more efficient to get rid of heat and moisture by ventilation of clothing through adjustable openings and button-up, than by passive diffusion through layers of garments. In some conditions with intermittent exposures (e.g. cold store work) or in conditions close to and above 0 °C the water vapour resistance value of fabrics become increasingly important and fabrics with a low value can contribute to improved heat balance and thermal comfort.

1 Scope

This European Standard specifies requirements and test methods for the performance of clothing ensembles (i.e. g two piece suits or coveralls) for protection against the effects of cold environments equal to or below −5°C (see Annex C). These effects comprise not only low air temperatures but also humidity and air velocity.

Requirements and test methods of garments for protection against cool environments are specified in EN 14058.

The protective effects and requirements of footwear, gloves and separate head wear are excluded from the scope of this standard.

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 20811:1992, *Textiles — Determination of resistance to water penetration — Hydrostatic pressure test*

EN ISO 4674-1:2016, *Rubber- or plastics-coated fabrics — Determination of tear resistance — Part 1: Constant rate of tear methods (ISO 4674-1:2016)*

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

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 13688:2013, *Protective clothing — General requirements (ISO 13688:2013)*

EN ISO 13938-1:1999, *Textiles — Bursting properties of fabrics — Part 1: Hydraulic method for determination of bursting strength and bursting distension (ISO 13938-1:1999)*

EN ISO 13938-2:1999, *Textiles — Bursting properties of fabrics — Part 2: Pneumatic method for determination of bursting strength and bursting distension (ISO 13938-2:1999)*

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

ISO 4675:2017, *Rubber- or plastics-coated fabrics — Low-temperature bend test*

ISO 7000:2014, *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
cold environment
environment characterized by the combination of humidity and wind (wind-chill effect) at air temperature equal to or less than −5 °C

3.2
garment
individual component of a clothing ensemble covering a part of the body, except separate garment for head, hands and feet and providing protection against hypothermia

3.3
ensemble
clothing consisting of a two-piece suit or one-piece suit (coverall) or a number of garments covering the body, except separate garment for 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

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

Note 2 to entry: The thermal resistance is expressed in square metres kelvin per watt.

[SOURCE: EN ISO 11092:2014, 2.1]

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

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 can consist of both diffusive and convective components.

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

[SOURCE: EN ISO 11092:2014, 2.2]

3.7
water-vapour permeability index
i_{mt}
ratio of thermal and water-vapour resistances in accordance with Formula (1):

$$i_{mt} = S \times \frac{R_{ct}}{R_{et}} \quad (1)$$

where

S = 60 Pa/K

Note 1 to entry: The water-vapour permeability index is dimensionless and has values between 0 and 1. A value of 0 implies that the material is water-vapour impermeable; that is, it has infinite water-vapour resistance, and a material with a value of 1 has both the thermal resistance and water-vapour resistance of an air layer of the same thickness.

[SOURCE: EN ISO 11092:2014, 2.3]

3.8
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 square metres Kelvin per watt.

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

Note 1 to entry: WP is expressed in pascal.

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

Note 1 to entry: AP is expressed in millimetre per second.

[SOURCE: EN ISO 9237:1995, 3.1]

3.11
outer shell material
outermost material of which the protective clothing is made

4 Performance assessment and requirements

4.1 General requirements and innocuousness

4.1.1 General requirements

When tested in accordance with 6.2.1 the following requirements shall be met:

— the garment shall not have rough, sharp or hard surfaces that irritate or injure the user;

— the jacket/coat or coverall shall be closable up to the collar or neckband;

— the jacket/coat or coverall shall be long enough to cover the tops of the trousers;

— external pockets intended to be used in wet conditions (see 4.4) shall be closable;

— closures, such as slide fasteners, fasteners, buttons etc. shall not open inadvertently;

— slide fasteners shall lock when completely closed.

In situations where the comfort can be reduced by the weight of the garment, preliminary wearing tests are recommended.

4.1.2 Innocuousness

When tested in accordance with 6.2.2 the requirements of EN ISO 13688:2013, 4.2, shall be met with regard to innocuousness.

4.2 Resultant effective thermal insulation I_{cler}

The resultant effective thermal insulation shall be calculated by Formula (2) and shall have a minimum value of 0,265 m²K/W when measured in accordance with 6.3:

$$I_{cler} = I_{tr} - I_{ar} \quad (2)$$

where

I_{tr} is the total thermal insulation from skin to ambient atmosphere, including clothing and boundary air layer, under defined conditions measured with a manikin moving its legs and arms under the conditions defined in EN ISO 15831:2004 in m²K/W;

I_{ar} is the result total thermal insulation of the boundary air layer with a manikin moving under the conditions defined in EN ISO 15831:2004 in m²K/W.

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

4.3 Air permeability, AP

When tested in accordance with 6.4, the air permeability AP shall be in accordance with Table 1.