



**SLOVENSKI STANDARD**  
**oSIST prEN 17673:2021**

**01-september-2021**

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**Varovalna obleka - Zaščita pred učinki toplote in plamena - Zahteve in preskusne metode za oblačila z integriranimi pametnimi tekstilijami in netekstilnimi deli**

Protective clothing - Protection against heat and flame - Requirements and test methods for garments with integrated smart textiles and non textile elements

Schutzkleidung - Kleidung zum Schutz gegen Hitze und Flammen - Anforderungen und Prüfverfahren für Kleidungsstücke mit integrierten smarten Textilien und nicht-textilen Elementen

Vêtements de protection - Protection contre la chaleur et les flammes - Exigences et méthodes d'essai pour les vêtements avec éléments intelligents textiles et non textiles intégrés

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**ICS:**

13.340.10	Varovalna obleka	Protective clothing
59.080.80	Inteligentne tekstilije	Smart textiles

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**DRAFT**  
**prEN 17673**

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ICS 13.340.10; 59.080.80

English Version

## Protective clothing - Protection against heat and flame - Requirements and test methods for garments with integrated smart textiles and non textile elements

Vêtements de protection - Protection contre la chaleur  
et les flammes - Exigences et méthodes d'essai pour les  
vêtements avec éléments intelligents textiles et non  
textiles intégrés

Schutzkleidung - Kleidung zum Schutz gegen Hitze und  
Flammen - Anforderungen und Prüfverfahren für  
Kleidungsstücke mit integrierten smarten Textilien  
und nicht-textilen Elementen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 162.

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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EUROPÄISCHES KOMITEE FÜR NORMUNG

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

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**prEN 17673:2021 (E)**

## **European foreword**

This document (prEN 17673:2021) 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 has been prepared under a mandate (M/553) given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

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## Introduction

This document concerns garments or assembly of garments providing protection against heat and flame, with integrated smart textiles and non-textile elements for enhanced health, safety and survival capabilities.

This document does not concern validating claims that the integrated smart textile and non-textile elements substitute directly any protection provided by the garment from a heat and flame perspective.

The integrated smart textiles and non-textile elements may include not only the parts integrated into the protective garment but also connections to external devices and the data generated and exchanged. It is not within the scope of this document to evaluate data storage or transmission as well as the connectivity to the external devices other than the hardware integrated into the garment.

The garments or assembly of garments as a whole will need to fulfil the heat and flame requirements of EN ISO 11612 and the general clothing requirements EN ISO 13688. The smart elements shall be treated similarly to hardware when testing according to these two standards.

The purpose of this document is to provide the additional requirements on identifying the need for additional testing of the smart textiles or non-textile elements and how they should be tested from a heat and flame perspective. Additional requirements, if applicable, from an electrical/electronic safety perspective also are addressed. The applicability of the additional requirements will need to be evaluated depending on the functionality of the smart textile or non-textile element and its needed efficacy in a heat and flame risks. At a minimum the smart textile or non-textile elements should not negatively impact the protection that the garment intends to fulfil.

This document is complementary to and does not intend to repeat the requirements of EN ISO 11612 and/or EN ISO 13688.

It is essential that the industrial workers using heat and flame personal protective equipment (PPE) and fire (and rescue) services, or their employers, carry out a risk assessment as well as a compatibility and ergonomics check of all parts of the PPE (e.g. SCBA, gloves, boots, etc.) to meet the requirements of the Directive (EC) 89/656 on the minimum health and safety requirements for the use by workers of personal protective equipment at the workplace. It is essential that workers and maintenance personnel are trained in the selection, use, care and maintenance of all personal protective equipment including the smart elements. Guidelines for selection, use, care and maintenance of garments or assembly of garments with integrated smart textiles and non-textile elements for enhanced health, safety and survival capabilities (smart garments) protecting against heat and flame are given in CEN/TR 17620.

This document was prepared under the standardization request M/553 as regards advanced garments and ensembles of garments that provide protection against heat and flame, with integrated smart textiles and non-textile elements for enhanced health, safety and survival capabilities, in support of Regulations (EU) No 1007/2011 and (EU) 2016/425 of the European Parliament and of the Council. This document fulfils the request for (a) European standard(s) in the field of declaration and measurement of properties and overall performance of advanced garments and ensembles of garments that provide protection against heat and flame, with integrated smart textiles and non-textile elements for enhanced health, safety and survival capabilities as stated in Annex II of the standardization request. As this request left it open to choose the detailed the committee decided to focus (i) on EN ISO 13688 as this document is an integral part of all PPE product standards for heat and flame protection and (ii) to not limit the application to only one or two categories of PPE (thus to include CAT III), which is why EN ISO 11612 rather than ISO 14116 was chosen.

## 1 Scope

This document applies to garments and assembly of garments providing protection against heat and flame, with integrated smart textiles and non-textile elements for enhanced health, safety and survival capabilities.

This document does not concern validating claims that the integrated smart textile and non-textile elements substitute directly any protection provided by the garment from a heat and flame perspective.

The integrated smart textiles and non-textile elements could include not only the parts integrated into the protective garment but also connections to transmit the data generated or exchange data with external devices. It is not within the scope of this document to evaluate either the data storage or transmission (including connectivity) to the external devices, nor the external devices. This document evaluates only the smart textiles and non-textile elements integrated into the garment.

This document supplements the requirements of EN ISO 11612 and EN ISO 13688 and does not replace any of the requirements cited in those documents.

This document sets additional testing and performance requirements linked specifically to the garments and assembly of garments providing protection against heat and flame, with integrated smart textiles and non-textile elements for enhanced health, safety and survival capabilities. These additional requirements will depend on the functionality of the smart textile or non-textile element and its needed efficacy during heat and flame hazards and risks from an electrical/electronic safety perspective in these situations.

## 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.

EN 1149-5, *Protective clothing — Electrostatic properties — Part 5: Material performance and design requirements*

EN 55015, *Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment*

EN 60068-2-6, *Environmental testing — Part 2-6: Tests — Test Fc: Vibration (sinusoidal) (IEC 60068-2-6)*

EN 60068-2-14, *Environmental testing — Part 2-14: Tests — Test N: Change of temperature (IEC 60068-2-14)*

EN 60079 (all parts), *Explosive atmosphere (IEC 60079)*

EN 60529, *Degrees of protection provided by enclosures (IP code) (IEC 60529)*

EN 60598-2-4:2018, *Luminaires — Part 2-4: Particular requirements — Portable general purpose luminaires (IEC 60598-2-4:2017)*

EN 61547, *Equipment for general lighting purposes — EMC immunity requirements (IEC 61547)*

EN 62133-2, *Secondary cells and batteries containing alkaline or other non-acid electrolytes — Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications — Part 2: Lithium systems (IEC 62133-2)*



EN 62493, *Assessment of lighting equipment related to human exposure to electromagnetic fields (IEC 62493)*

EN 14360, *Protective clothing against rain — Test method for ready made garments — Impact from above with high energy droplets*

EN ISO 3376, *Leather — Physical and mechanical tests — Determination of tensile strength and percentage elongation (ISO 3376)*

EN ISO 4048, *Leather — Chemical tests — Determination of substances soluble in dichloromethane and content of free fatty acids (ISO 4048)*

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 11612:2015, *Protective clothing — Clothing to protect against heat and flame — Minimum performance requirements (ISO 11612:2015)*

EN ISO 13506-1, *Protective clothing against heat and flame — Part 1: Test method for complete garments — Measurement of transferred energy using an instrumented manikin (ISO 13506-1:2017)*

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

EN ISO 13934-1, *Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method (ISO 13934-1)*

EN ISO 13935-2, *Textiles — Seam tensile properties of fabrics and made-up textile articles — Part 2: Determination of maximum force to seam rupture using the grab method (ISO 13935-2)*

EN ISO 13937-2, *Textiles — Tear properties of fabrics — Part 2: Determination of tear force of trouser-shaped test specimens (Single tear method) (ISO 13937-2)*

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 15025:2016, *Protective clothing — Protection against heat and flame — Method of test for limited flame spread (ISO 15025:2016)*

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

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

ISO 13506-2, *Protective clothing against heat and flame — Part 2: Skin burn injury prediction — Calculation requirements and test cases*

ISO 17493, *Clothing and equipment for protection against heat — Test method for convective heat resistance using a hot air circulating oven*

CEN/TR 17512, *Personal protective equipment — Smart garments — Terms and definitions*

CEN ISO/TR 11610, *Protective clothing - Vocabulary (ISO/TR 11610)*

IEC/TR 62778, *Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in CEN/TR 17512 and in CEN ISO/TR 11610, and the following apply.

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

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

#### 3.1

##### **assembly of garments**

series of garments arranged in the order as worn

Note 1 to entry: Assembly of garments (clothing) may contain multilayer materials, material combinations, or a series of separate garments in single layers.

Note 2 to entry: Clothing assembly, garment assembly and assembly of garments are synonyms.

[SOURCE: EN ISO 11612:2015, 3.3, modified.]

#### 3.2

##### **(electronic) component**

(electronic) constituent part of a device which cannot be physically divided into smaller parts without losing its particular function

[SOURCE: IEC 60050-151:2001, 151-11-21]

#### 3.3

##### **(electronic) device**

material element or assembly of such elements intended to perform a required function

[SOURCE: IEC 60050-151:2001, 151-11-20]

#### 3.4

##### **(electronic) hardware**

physical artefact or devices in communication or device(s) in information processing

Note 1 to entry: (Electronic) hardware is not to be confused with (protective garment) hardware.

[SOURCE: CEN/TR 17512:2020, 3.4.11]

#### 3.5

##### **(protective garment) hardware**

non-fabric items forming part of or optional extras in a garment

EXAMPLE Metal or plastic buttons, zippers, touch and close fasteners or hook and loop fasteners.

Note 1 to entry: (Protective garment) hardware is not to be confused with (*electronic*) hardware.

Note 2 to entry: Sometimes garment and electronic hardware can be combined, for example, a press button functioning as a switch.

[SOURCE: EN ISO 11612:2015, 3.8, modified.]

**3.6****integrated smart textile**

integrated element for which the element is a smart textile system

[SOURCE: CEN/TR 17512:2020, 3.3.7]

**3.7****integrated non-textile element**

integrated element for which the element is a non-textile element

Note 1 to entry: Smart textiles may contain non-textile elements.

[SOURCE: CEN/TR 17512:2020, 3.3.8]

**3.8****non-textile element**

product which is not composed of textile fibres

Note 1 to entry: Non-textile elements may contain, for example, active medical devices, radio and electrically operated components, slide fasteners, (press) buttons, membranes or non-textile patches.

[SOURCE: CEN/TR 17512:2020, 3.1.4]

**3.9****smart personal protective system**

combination of single items of personal protective equipment that protects against applicable/relevant risks encountered by the wearer and which exhibits an intended and exploitable response either to changes in its surroundings/environment or to an external signal/input

Note 1 to entry: The expression "smart PPE" is used as a metonymy to represent a smart personal protective system.

Note 2 to entry: Examples for all other auxiliary equipment or elements are ICT hardware and software, data logging, monitoring and warning systems (both the individual and the safety management), localization equipment and communication systems. Parts of the PPS include PPE such as: head protection (helmet), hearing protection, eye and face protection, respiratory protection, protection against fall from a height, foot protection (safety shoes, boots), hand protection (gloves, arm protection) or body protection/protective garments (incl. e.g. ballistic impact protection).

Note 3 to entry: The presence of electronics does not automatically mean smart and there might be other ways to make a personal protective system smart than by electronics.

[SOURCE: CEN/TR 17512:2020, 3.6.1]

**3.10****smart (intelligent, interactive) textile <system>**

textile based system which exhibits an intended and exploitable response either to changes in its surroundings/environment or to an external signal/input

[SOURCE: CEN ISO/TR 23383:2020, 2.6]

**prEN 17673:2021 (E)****3.11****smart textile material (intelligent textile material, interactive textile material)**

functional textile material, which interacts reversibly with its environment, i. e. it responds or adapts to changes in the environment

Note 1 to entry: The term “smart textile” may refer to either a “smart textile material” or a “smart textile system”. Only the context, in which the term is used, will determine which one of the two is intended.

[SOURCE: CEN ISO/TR 23383:2020, 2.3]

**4 General requirements**

Warning for personal protection and safety of test operators: Care is to be taken to prevent the personnel from coming into contact with combustion products, smoke and fumes resulting from the flame exposure. Exposure to gaseous products should be prevented by adequate ventilation of the chamber. Appropriate care shall be taken prior and during testing for materials or components/devices (e.g. batteries) that may combust or potentially explode upon exposure to the temperatures applied during testing.

Garments and assembly of garments providing protection against heat and flame, with integrated smart textiles and non-textile elements shall meet the requirements of EN ISO 11612 and EN ISO 13688, unless specific provisions of these standards are modified in this document. In any case, the integrated smart textiles or non-textile elements shall not negatively impact these requirements.

This document is split in three main requirements sections, adding to or modifying the interpretation of:

- EN ISO 13688;
- EN ISO 11612;
- Safety of the smart textile or non-textile elements (with a focus on electric components).

NOTE Since the requirements of EN ISO 13688 are included in the requirements of EN ISO 11612, any garment or assembly of garments which meets the requirements of EN ISO 11612 will by default meet the requirements of EN ISO 13688.

**5 Sampling, conditioning and pre-treatment****5.1 Sampling**

A representative specimen, including all integrated smart textiles and non-textile elements used in the final product and assembled under the same conditions as in the final product, shall be used. The specimen size shall be determined following the instructions from EN ISO 11612 or from Clause 8 of this document.

A schematic drawing/diagram of where the smart components are located in the garment, including in which layers and how they might pass through the different layers of the garment shall be provided with either the garment or the specimens for testing.

This description, including the garment or the samples to be tested, will allow laboratories to correctly identify what and how these should be tested.

**5.2 Conditioning**

The specimen for testing shall be conditioned according to EN ISO 11612 unless specified differently in the Clauses of this document.