# SLOVENSKI STANDARD
# SIST EN 533:1998

**01-maj-1998**

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**Varovalna obleka - Varovanje pred učinki toplote in plamena - Materiali in kombinacije materialov z omejeno stopnjo gorljivosti**

Protective clothing - Protection against heat and flame - Limited flame spread materials and material assemblies

Schutzkleidung - Schutz gegen Hitze und Flammen - Materialien und Materialkombinationen mit begrenzter Flammenausbreitung



Vetements de protection - Protection contre la chaleur et la flamme - Matériaux et assemblages de matériaux a propagation de flamme limitée



**Ta slovenski standard je istoveten z:** **EN 533:1997**

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**ICS:**

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| 13.220.40 | Sposobnost vžiga in obnašanje materialov in proizvodov pri gorenju | Ignitability and burning behaviour of materials and products |
| 13.340.10 | Varovalna obleka | Protective clothing |

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**EN 533**

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Descriptors: personal protective equipment, protective clothing, heat protection, fire resistant materials, specifications, tests, flame propagation, marking

English version

# Protective clothing - Protection against heat and flame - Limited flame spread materials and material assemblies

Vêtements de protection - Protection contre la chaleur et la flamme - Matériaux et assemblages de matériaux à propagation de flamme limitée

Schutzkleidung - Schutz gegen Hitze und Flammen - Materialien und Materialkombinationen mit begrenzter Flammenausbreitung

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.



The European Standards exist in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



**CEN**

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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## Foreword

This European Standard 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 July 1997, and conflicting national standards shall be withdrawn at the latest by July 1997.

This European Standard 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 standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



## 0 Introduction

This European Standard specifies performance requirements for limited flame spread materials and material assemblies used in protective clothing. Limited flame spread materials and material assemblies are used in protective clothing in order to reduce the possibility of the clothing burning and thereby itself constituting a hazard.

Protective clothing constructed from materials and material assemblies complying with this European Standard is suitable for protection against accidental contact with small igniting flames, in circumstances where there is no significant heat hazard. Limited flame spread materials and material assemblies are also used in clothing for protection against heat hazards, when additional test methods and performance standards must be applied and EN 531 is more appropriate.

Performance is expressed in terms of a limited flame spread index based on the results of testing by EN 532. Three levels of performance are specified.

Index 1 materials do not spread flame but may form a hole on contact with a flame.

Index 2 materials and material assemblies do not spread flame and do not form a hole on contact with a flame.

Index 3 materials and material assemblies do not spread flame and do not form a hole on contact with a flame. They also give only limited afterflame .

It is not possible to specify a higher level for materials and material assemblies which do not give any afterflame or damage at all, because classification has been found to be inconsistent due to slight interlaboratory variations.

Index 1 materials are thermoplastics which do not spread flame if accidentally contacted with a flame but do not protect the underlying material or skin. Index 1 materials should only be used as part of an index 2 or 3 material assembly and should not be worn next to the skin.

Protective clothing may consist of several, separate garments, or it may be a single garment with one or more layers. Normally it is sufficient for the outer material to have limited flame spread properties, and material assemblies from multilayer clothing are tested by applying the flame to the outer surface. Optional alternative testing and marking requirements are given for material assemblies from garments where there is a risk that inner layers might be exposed to flame contact.

The limited flame spread properties of the materials and material assemblies are measured both before and after an appropriate cleansing or water soaking procedure and the procedure employed is indicated by a durability index. Marking requirements specify that this European Standard number, the limited flame spread index and the durability index are always quoted together.

## 1 Scope

This European Standard specifies the performance requirements for the limited flame spread properties of materials and material assemblies used in protective clothing.

A classification system is given for materials and material assemblies tested according to EN 532 : Protective clothing Protection against heat and flame- Test method for limited flame spread, before and after a standard cleaning procedure.



## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revision of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.



EN 340
Protective clothing - General requirements

EN 532
Protective clothing - Protection against heat and flame - Test method for limited flame spread

EN ISO 10528
Method for assessing the effect of laundry washing on the flammability of textile fabrics

ISO 3175
Textiles - Determination of dimensional change on dry cleaning in perchlorethylene - Machine method

## 3 Definitions

For the purposes of this standard, the following definitions apply.

**3.1 Limited flame spread index:** A number indicating that the material or material asssembly achieved one of the levels given in clause 7.

**3.2 Durability Index**: A letter X or R indicating that the material or material assembly was subjected to a cleansing procedure specified in clause 6 before being tested for limited flame spread.

**3.3 Material:** A single fabric or other product, e.g one layer of a woven, knitted, or coated fabric , or a multi-layered fabric or other product combined prior to the garment manufacturing process, e.g. a laminated or quilted fabric. A material test specimen represents or is taken from a single layer of a garment.

**3.4 Material assembly:** Two or more separate layers of the same or different materials. A material assembly test specimen represents or is taken from the various layers in a single garment or in a series of garments in a clothing system, assembled in equal size and in the order of use.

**3.5 Hole:** A break in the test specimen at least 5 mm by 5 mm in size caused by melting, glowing or flaming.

## 4 Performance specification

### 4.1 Materials

All materials claiming compliance with this European Standard shall have a limited flame spread index of 1, 2, or 3 (see clause 7) when tested in accordance with EN 532 . Materials giving Index 1 shall only be used as part of a material assembly complying with index 2 or 3 (see 4.2) and shall be supplied with a statement that they shall not be used next to the skin (see 8.1 d).

### 4.2 Material assemblies

All material assemblies claiming compliance with this European Standard shall have a limited flame spread index of 2 or 3 when tested in accordance with EN 532 with the flame applied to the outer face.

The following requirements are optional :

a) the material assembly shall have a limited flame spread index of 2 or 3 when tested in accordance with EN 532 with the flame applied to the outer face and to the inner face,

or

b) the material assembly shall be comprised entirely of materials complying with index 2 or 3.

### 4.3 Durability

All materials and assemblies, except aluminised materials and leather, shall meet these requirements both before and after the appropriate cleansing procedure X or R in accordance with clause 6. The limited flame spread index quoted shall be the lowest value determined either before or after cleansing.



## 5 Sampling

### 5.1 Materials

A representative sample of sufficient size to provide the required two sets of six specimens shall be taken. (One set in the case of aluminised materials or leather).



### 5.2 Material assemblies

Sufficient of each material in the assembly, or sufficient garments of the same style shall be taken, so as to provide the required two sets of six specimens.

NOTE 1: This European Standard is designed to assess the performance of the material or material assembly used in the garment and not the garment construction. Specimens taken from garments should be typical of the garment construction, but should not include seams, closure systems, or specific garment design features.

NOTE 2: Additional sets of specimens are needed if material assemblies are to be tested on both the outer and the inner faces (see 4.2 a ).

NOTE 3: The EN 532 specimen size is (200 ± 1) mm by (160 ± 1) mm. The alternative 80 mm wide specimen may only be used on materials and material assemblies which do not burn to the side edges of the narrower specimen.

## 6 Durabilty to cleansing or wetting

**6.1** Durability tests are not applied to aluminised materials (which are marked with the letter A) or leather (which is marked with the letter L). Therefore, only one set of unwashed specimens is tested.

**6.2** Except as specified in 6.1, materials or material assemblies shall be tested both before and after a cleansing procedure, in accordance with 6.3 or 6.4.

**6.3** The standard wash procedure shall be 12 wash cycles at 75°C in accordance with the industrial laundry procedure of EN ISO 10528. Items tested after this procedure shall be marked with the letter X.

It is possible to modify the washing treatment by carrying out at least five wash cycles using a wash temperature conforming to the manufacturer's maintenance instructions. In such cases the durability index shall be in the form -

number of wash cycles, letter X, wash temperature in °C.

**6.4** Materials or material assemblies , other than those defined in 6.1, which are adversely affected by washing, shall be tested after water soaking in accordance with the procedure of annex A followed by five dry cleaning cycles in accordance with ISO 3175. Items tested after this procedure shall be marked with the letter R.

NOTE: Materials treated with flame retardants which are not durable to wetting with water are considered unsuitable for use in protective clothing.

## 7 Classification

### 7.1 Requirements for limited flame spread index 1.

No specimen shall permit any part of the lowest boundary of any flame or hole to reach the upper or either vertical edge.

No specimen shall give flaming debris.

Any afterglow shall not spread from the carbonised area to the undamaged area after the cessation of flaming.

### 7.2 Requirements for limited flame spread Index 2

No specimen shall permit any part of the lowest boundary of any flame to reach the upper or either vertical edge.



No specimen shall give flaming debris.



Any afterglow shall not spread from the carbonised area to the undamaged area after the cessation of flaming.

No specimen shall give hole formation



### 7.3 Requirements for limited flame spread Index 3

No specimen shall permit any part of the lowest boundary of any flame to reach the upper or either vertical edge.

No specimen shall give flaming debris.

Any afterglow shall not spread from the carbonised area to the undamaged area after the cessation of flaming.

No specimen shall give hole formation.

The mean afterflame time of any set of six specimens shall not exceed 2 s.

# 8 Manufacturer's information

## 8.1 Single layer materials

All single layer materials claiming compliance with this European Standard shall be supplied with the following information:

a) the manufacturer's name, trade mark or other identifying mark;

b) a statement "material complies with EN 533 Indices 0/0" as appropriate.

The limited flame spread index shall always be quoted together with the durability index or the letter A or L, e.g 3/X indicates material meets flammability index 3 after 12 washes at 75°C, 2/5X60 indicates meets flammability index 2 after 5 washes at 60 °C.

c) instructions for the care and cleansing of the material, in agreement with the durability index quoted above, and with particular emphasis on any special precautions to be taken.

d) if the material is classified as index 1, a statement "Use only over EN 533 Index 2 or 3 material and do not use next to the skin"

## 8.2 Material assemblies

All material assemblies claiming compliance with this European Standard shall be supplied with the information in 8.1 but with the statement required under 8.1.b) modified to -

"material assembly complies with EN 533 Indices 0/0: outer face tested", as appropriate.:

Optionally, if the requirements of 4.2.a) are satisfied the statement shall be -

" material assembly complies with EN 533 Indices 0/0 : outer face tested and Indices 0/0 : inner face tested".

Optionally, if the requirements of 4.2.b) are satisfied the statement shall be-

"each material in the assembly complies with EN 533", with Indices given for each layer.

The presence of any Index 1 material in the assembly shall be indicated.

NOTE: The EN 533 flammability indices may be used by material manufacturers to indicate the flame spread behaviour of their materials. They may also be used by protective clothing manufacturers to indicate the flame spread behaviour of the material or material assembly used in protective clothing. The use of an EN 533 marking on a garment only indicates the limited flame spread properties of the material or material assembly used in its construction. General requirements for protective clothing are given in EN 340. Specific requirements for protective clothing against specified heat and flame hazards are given in other standards.

# Annex A (normative)

## Water soaking procedure

### A.1 Scope

This procedure is applicable to materials and material assemblies which are not normally washed but which could be subjected to water soaking in use. It is used as a preliminary treatment before dry cleaning in order to remove any water soluble finishes which might be affected by water soaking in use.

### A.2 Reagents

**A.2.1 Water**, of (160 ± 20) mg/l hardness (expressed as calcium carbonate) at a temperature of (40 ± 3) °C.

If the initial hardness of the supply water n mg/l is greater than 180 mg/l it shall be diluted to the required level by addition of water of lower hardness.

If the initial hardness of the supply water n mg/l is below 140 mg/l it shall be artificially hardened to the required level. To 5 l of water add 500 ml of calcium chloride solution (see A.2.2.), followed by 500 ml of sodium hydrogen carbonate solution (see A.2.3) and then add sufficient water to give a total of (10 ± 0,1) l.

**A.2.2** Calcium chloride hexahydrate solution, 43,8 x (160 - *n*) mg/l solution in water of hardness n mg/l.

**A.2.3** Sodium hydrogen carbonate, 33,6 x (160 - *n*) mg/l solution in water of hardness n mg/l.

**A.2.4** Non-ionic wetting agent. The exact nature of this reagent is not critical.

### A.3 Apparatus

Flat bottomed dish of sufficient size to enable the test specimens to be completely immersed.

### A.4 Sampling

Use sufficient material to provide the required number and size of specimens for subsequent testing.

### A.5 Procedure

Using a liquor to material ratio of 20:1 , completely immerse each specimen in the water (see A.2.1) containing 0.5 g/l non-ionic wetting agent (see A.2.4) at an initial temperature of (40 ± 3) °C. Ensure that the specimen remains completely immersed. After 30 min , remove and drain the specimen, and immerse in fresh water (see A.2.1) at a liquor raio of 20:1 for 2 min. Remove and drain the specimen and allow to line dry.

NOTE: If the specimen has to be folded it should be folded along fresh creases for the second immersion. It may need ironing to remove the creases before flammability testing