SLOVENSKI STANDARD
SIST EN ISO 6942:2002

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Nadomešča:

SIST EN 366:1996

Varovalna obleka - Zaščita pred toploto in ognjem - Metoda preskušanja za vrednotenje materialov in izdelkov iz teh materialov, ki so izpostavljeni viru toplotnega sevanja (ISO 6942:2002)

Protective clothing - Protection against heat and fire - Method of test: Evaluation of materials and material assemblies when exposed to a source of radiant heat (ISO 6942:2002)

Schutzkleidung - Schutz gegen Hitze und Feuer - Prüfverfahren: Beurteilung von Materialien und Materialkombinationen, die einer Hitze-Strahlungsquelle ausgesetzt sind (ISO 6942:2002)

Vetements de protection - Protection contre la chaleur et le feu - Méthode d'essai: Evaluation des matériaux et assemblages des matériaux exposés a une source de chaleur radiante (ISO 6942:2002)

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13.340.10 Varovalna obleka Protective clothing

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Protective clothing - Protection against heat and fire - Method of test: Evaluation of materials and material assemblies when exposed to a source of radiant heat (ISO 6942:2002)

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This European Standard was approved by CEN on 12 November 2001.

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This European Standard exists 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 Management Centre has the same status as the official versions.

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

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This document (ISO 6942:2002) has been prepared by Technical Committee ISO/TC 94 “Personal safety - Protective clothing and equipment” in collaboration with 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 December 2002, and conflicting national standards shall be withdrawn at the latest by December 2002.

This document supersedes EN 366:1993.

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.

Annex A is informative.

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

Introduction

Protective clothing against radiant heat is worn at different occasions and accordingly the radiation intensity (characterised by the heat flux density) acting on the clothing material extends over a wide range. This European Standard describes two test methods which can be applied to all sorts of materials, but, according to the intended use of the material, the heat flux density has to be chosen properly and the results have to be interpreted correctly,

Industrial workers or fire fighters may be exposed to a relatively low radiation intensity over a long period of time. On the other hand, industrial workers or fire fighters may be exposed to medium radiation intensities for relatively short periods of time or to high radiation intensities for very short periods of time. In the latter case, the clothing material may be changed or even destroyed.

The materials for the protective clothing should be tested at medium and high heat flux densities. The reaction on method A and the times t_{12} and t_{24} and transmission factor measured with method B characterise the material. Information of the precision of method B see annex A.

1 Scope

This European Standard specifies two complementary methods (method A and method B) for determining the behaviour of materials for heat protective clothing subjected to heat radiation.

These tests are carried out on representative single or multi-layer textiles or other materials intended for clothing for protection against heat. They are also applicable to assemblies, which correspond to the overall build up of a heat protective clothing assembly with or without underclothing.

Method A serves for visual assessment of any changes in the material after the action of heat radiation. With method B the protective effect of the materials is determined. The materials may be tested either by both methods or only by one of them.

The tests according to these two methods serve to classify materials; however, to be able to make a statement or prediction as to the suitability of a material for protective clothing additional criteria must be taken into account.

Since the tests are carried out at room temperature the results do not necessarily correspond to the behaviour of the materials at higher ambient temperatures and therefore are only to a limited extent suitable for predicting the performance of the protective clothing made from the materials under test.

2 Normative reference

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

EN 20139
Textiles - standard atmospheres for conditioning and testing (ISO 139:1973)

IEC 60584-1
Thermocouples. Part 1: Reference table

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply,

3.1
heat transfer levels

Time t_{12} The time in seconds expressed to one decimal place, to achieve a calorimeter temperature rise of (12 ± 0,1) °C

Time t_{24} The time in seconds expressed to one decimal place, to achieve a calorimeter temperature rise of (24 ± 0,2) °C

3.2
heat transmission factor (TF)

A measure of the fraction of heat transmitted through a specimen exposed to a source of radiant heat. It is numerically equal to the ratio of the transmitted to the incident heat flux density.

3.3
test specimen

All the layers of fabric or other material arranged in the order and orientation as used in practice and including undergarments if appropriate.

3.4
incident heat flux density:

The amount of energy incident per unit time on the exposed face of the calorimeter, expressed in kW/m^2.

3.5
radiant heat transfer index (RHTI)

A number, to one decimal place calculated from the mean time (measured in seconds, to one decimal place) to achieve a temperature rise of (24 ± 0,2) °C in the calorimeter when testing by this method with a specified incident heat flux density.

3.6
change in appearance of the specimen

All changes in appearance of the material (shrinkage, formation of char, discoloration, scorching, glowing melting etc.).

3.7
multi-layer clothing assembly

series of layers in garments arranged in the order as worn

NOTE It may contain multi-layer materials , material combinations or separate layers of clothing material in single layers.

4 Principle

4.1 Method A

A specimen is supported in a free-standing frame (specimen holder) and is exposed to a specific level of radiant heat for a specific time. The level of radiant heat is set by adjustment of the distance between the specimen and the thermal radiation source. Following the exposure, the specimen and its individual layers, are examined for visible changes.

4.2 Method B

A specimen is supported in a free-standing frame (specimen holder) and is exposed to a specific level of radiant heat. The times for temperature rises of 12 °C and 24 °C in the calorimeter are recorded and are expressed as radiant heat transfer indexes. The percentage heat transmission factor is calculated from the temperature rise data and is also reported.

5 Apparatus

5.1 General

The test apparatus consists of the following items, which are used for both test methods:

- source of radiation (5.2);
- test frame (5.3);
- specimen holder (5.3).

For method B, the following are also required:

- calorimeter (5.4);
- temperature measuring and recording device (5.5).

5.2 Source of radiation

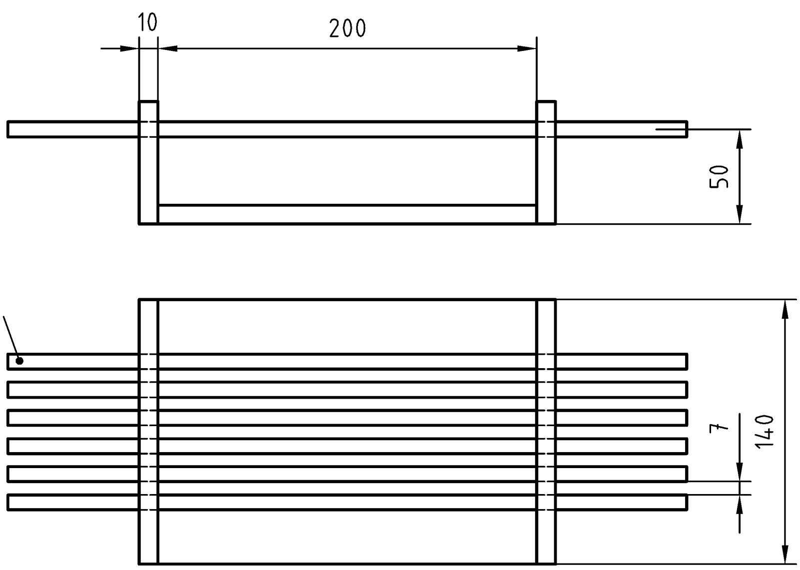
The radiation source consists of six silicon carbide (SiC) heating rods, with the following characteristics:

- total length: (356 ± 2) mm;
- length of heating part: (178 ± 2) mm;
- diameter: (7,9 ± 0,1) mm;
- electrical resistance: 3,6 Ω ± 10 % at 1070 °C.

These rods are placed in a U-shaped support made of insulating, flame resistant material so that they are arranged horizontally and in the same vertical plane. Figure 1 shows the constructional details of the support and the arrangement of the heating rods, which, are loosely mounted in the grooves of the support to avoid mechanical stress.

Dimensions in millimetres

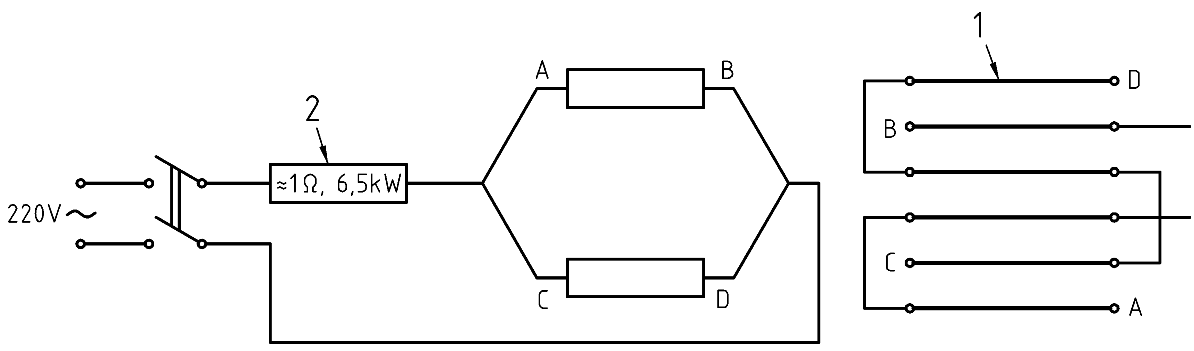
(tolerance for measurements ± 0,1 mm)



1 Silicon carbide rod

Figure 1: Source of radiation

A diagram of a possible power supply for the radiation source is shown in figure 2. The six rods are arranged into two groups of three, placed in series. The two groups are connected in parallel and are wired to the 220 V supply through a pre-resistance of 1 Ω. For other supply voltages, the circuit has to be changed accordingly. If the supply voltage fluctuates by more than ± 1 % during a measurement, stabilisation has to be provided.



1 Silicon carbide rod
2 Pre-resistance

Figure 2: Circuit diagram for heating rods

The electrical connections of the heating rods shall be made carefully (e.g. by means of a stranded aluminium band), taking into consideration that the rods become very hot. Precautions shall be taken to avoid short circuits between the rods.

The correct operation of the radiation source can be checked by using an infrared thermometer to measure the temperature of the silicon carbide rods. After allowing the radiation source to warm up for about five minutes, the rods should have reached a temperature of about 1100 °C.

5.3 Specimen holder

Different specimen holders are used for tests A and B. They are constructed from 2 mm thick steel sheets fixed to a 10 mm thick aluminium plate . The specimen holder for test A has wider side plates than the specimen holder for test B. The specimen holder for test B also holds the calorimeter in position.

The specimen holders are fastened so that they fit concentrically into the opening of the vertical of the test frame. When fixed in position, the specimen holder for tests A hold the back of the specimen 10 mm behind the sheet metal cover at the front of the test frame. The specimen holder for test B holds the vertical centre line of the calorimeter 10 mm behind the sheet metal cover at the front of the test frame.

5.4 Calorimeter

The curved copper plate calorimeter is constructed as follows.

A rectangle (50 mm by 50,3 mm) is cut from a copper sheet of at least 99 % purity and 1,6 mm thick. This copper plate is bent in the longer direction into an arc with a radius of 130 mm. The chord across this arc should be approx. 50 mm. The copper plate should be accurately weighed before assembly and should have a mass of 35,9 to 36 g.

A copper constantan thermocouple, with an output in millivolts complying with IEC 60584-1, is mounted on the back of the copper plate. Both wires should be attached to the centre of the plate using the minimum amount of solder. The diameter of both wires should be 0,26 mm or less and only the length attached to the plate should be bared.

The calorimeter is located in a mounting block which shall consist of a 90 mm by 90 mm square piece of asbestos-free non-combustible, heat insulation board of nominal thickness 25 mm. The thermal characteristics of the board should comply with the following specification: