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Zahteve za spalne vreče

Requirements for sleeping bags

Anforderungen für Schlafsäcke

Exigences relatives aux sacs de couchage

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Requirements for sleeping bags

Exigences pour les sacs de couchage

Anforderungen an Schlafsäcke

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Foreword

This document (EN 13537:2012) has been prepared by Technical Committee CEN/TC 136 “Sports, playground and other recreational facilities and equipment”, 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of an identical text or by endorsement, at the latest by November 2012, and conflicting national standards shall be withdrawn at the latest by November 2012.

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

This document supersedes EN 13537:2002.

In comparison with EN 13537:2002, the following changes have been made:

a) the calibration of thermal manikins for the measurement of thermal insulation of a sleeping bag has been introduced following the results of an extensive round robin test between 6 laboratories using a reference set of sleeping bags. This has improved the precision and reproducibility of the test results;

b) the test procedure of the thermal resistance measurement of the sleeping bag with the thermal manikin has been specified in more detail, improving the reproducibility of the test results;

c) a pre-treatment has been introduced for the thermal property tests for the sleeping bag;

d) measurement of the inside dimensions of sleeping bags has been included. It was formally specified in EN 13538-1 which has been withdrawn;

e) the thickness and elastic recovery of the sleeping bag, as determined by EN 13538-2, has been deleted from the requirements;

f) the easiness of packaging of the sleeping bag, as determined by EN 13538-3, has been deleted from the requirements;

g) based on new research, the extreme temperature limits in Table 1 have been recalculated and amended.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European Standard has been substantially revised. The objectives of the revision were to simplify the standard by deleting requirements and test methods which had not been proven to be sufficiently reproducible or which did not contribute to the safety and quality performance of sleeping bags. The revision was also conducted in order to improve the inter-laboratory variability and repeatability of the test method for determination of the thermal properties of a sleeping bag.

Since the last edition of this European Standard, products in the market have evolved to reflect the changing needs of the user. It was the intention of the committee during this revision that the standard would reflect these continuous and changing needs and not become restrictive in respect of future technology and advances in the manufacturing industry.

In buying a sleeping bag, the consumer expects (along with other aspects such as functional design, good fit, low weight and volume and durability), information regarding which temperature range the sleeping bag can be used. This temperature range serves to prevent the person in the bag feeling too cold on the one hand or too hot, combined with unpleasant sweating, on the other. The primary aim of this European Standard is to provide this information to the consumer by specifying a test procedure and an evaluation model to quantify the thermophysiological function of sleeping bags (see also Annex E).

An inter-laboratory test, involving six different laboratories, was organised within the present CEN working group on a set of six sleeping bags filled with feathers and downs and synthetics. Six human shaped thermal manikins were used, consisting of 6 to 35 independent segments and corresponding to the requirements for testing protective clothing against cold.

The test showed the following conclusions:

— even with multi-sectional manikins, the design and especially the number of independent sections can influence the value of thermal resistance by up to 20 %;

— yet the test results of thermal resistance with all manikins showed a maximum difference of 10 % (leading e.g. to a difference in T_{lim} of 3,0 °C for a sleeping bag with T_{lim} = 0 °C);

— the weight of the manikin did not significantly effect the test results.

1 Scope

This European Standard specifies the requirements and test methods as well as provisions for labelling of adult sized sleeping bags for use in sports and leisure time activities.

This European Standard does not apply to sleeping bags intended for specific purpose such as military use and extreme climate zone expedition. It does not apply to sleeping bags for children or babies: no prediction model exists for the determination of the limiting temperatures based on the thermal resistance of the sleeping bag for these demographics. Moreover, such a model for testing cannot be developed because the necessary controlled sleep trials with children or babies in climatic chambers are, out of ethical reasons, not permitted.

This European Standard describes the method for the assessment of the performance in steady state conditions of a sleeping bag with regard to the protection against cold.

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 12130, *Feather and down — Test methods — Determination of the filling power (massic volume)*

EN 12132-1, *Feather and down — Methods of testing the down proof properties of fabrics — Part 1: Rubbing test*

EN 12934, *Feather and down — Composition labelling of processed feathers and down for use as sole filling material*

EN 12935, *Feather and down — Hygiene and cleanliness requirements*

EN 13088, *Manufactured articles filled with feather and down — Method for the determination of a filled product's total mass and of the mass of the filling*

EN 13538-3, *Determination of dimensional characteristics of sleeping bags — Part 3: Volume under load and easiness of packing*

EN 15586, *Textiles — Methods of testing the fibre proof properties of fabrics: Rubbing test*

EN 29073-1, *Textiles — Test methods for nonwovens — Part 1: Determination of mass per unit area*

EN ISO 105-B02, *Textiles — Tests for colour fastness — Part B02: Colour fastness to artificial light: Xenon arc fading lamp test (ISO 105-B02)*

EN ISO 105-C06, *Textiles — Tests for colour fastness — Part C06: Colour fastness to domestic and commercial laundering (ISO 105-C06)*

EN ISO 105-E04, *Textiles — Tests for colour fastness — Part E04: Colour fastness to perspiration (ISO 105-E04)*

EN ISO 105-X12, *Textiles — Tests for colour fastness — Part X12: Colour fastness to rubbing (ISO 105-X12)*

EN ISO 139, *Textiles — Standard atmospheres for conditioning and testing (ISO 139)*

EN ISO 3758, *Textiles — Care labelling code using symbols (ISO 3758)*

EN ISO 12947-1, *Textiles — Determination of the abrasion resistance of fabrics by the Martindale method — Part 1: Martindale abrasion testing apparatus (ISO 12947-1)*

EN ISO 12947-2, *Textiles — Determination of the abrasion resistance of fabrics by the Martindale method — Part 2: Determination of specimen breakdown (ISO 12947-2)*

EN ISO 13937-1, *Textiles — Tear properties of fabrics — Part 1: Determination of tear force using ballistic pendulum method (Elmendorf) (ISO 13937-1)*

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

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

3 Terms and definitions

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

3.1
manufacturer
organization responsible for designing and manufacturing a sleeping bag covered by this European Standard

3.2
comfort temperature (T_{comf})
lower limit of the comfort range, down to which a sleeping bag user with a relaxed posture, such as lying on their back, is globally in thermal equilibrium and just not feeling cold

Note 1 to entry: For more information see C.7.3.

3.3
limit temperature (T_{lim})
lower limit at which a sleeping bag user with a curled up body posture is globally in thermal equilibrium and just not feeling cold

Note 1 to entry: For more information see C.7.2.

3.4
extreme temperature (T_{ext})
lower extreme temperature where the risk of health damage by hypothermia occurs

Note 1 to entry: For more information, see C.7.1.

Note 2 to entry: This is a point of danger which can lead to death.

3.5
maximum temperature (T_{max})
upper limit of comfort range, up to which a partially uncovered sleeping bag user just does not perspire too much

Note 1 to entry: For more information see C.7.4.

3.6
thermal manikin
dummy with human shape and heated body surface which allows the determination of thermal transfer through the sleeping bag under steady-state conditions (i.e. constant heat flux and temperature gradient between body surface and ambient air)

3.7
thermal resistance (R_c)
thermal insulation
property of the sleeping bag which is related to the dry heat loss of the sleeping bag user (a combination of conductive, convective and radiative heat transfer), effected by the difference of temperature between the skin and the ambient air, as measured with a thermal manikin

Note 1 to entry: This thermal resistance represents the insulative property of a sleeping bag, which includes the effects of the shell fabrics and filling materials, air volume in the cavity inside the sleeping bag, boundary air layer on the outer face of the sleeping bag, mattress underneath the sleeping bag and garments worn by the sleeping bag user.

4 Requirements and test methods

4.1 General

For test procedures that refer to EN ISO 139, the default conditions of 20 °C and 65 % relative humidity shall be used.

4.2 Fabrics

4.2.1 Down proofness

When testing the fabric/fabric combinations of the shell or lining of the sleeping bag in accordance with EN 12132-1, the number of feather and/or down particles counted as required in EN 12132-1 shall not exceed ten for each fabric/fabric combination.

4.2.2 Synthetic fibre proofness

When tested in accordance with EN 15586, the number of synthetic fibres protruded through the fabric of the sleeping bags shall not exceed 30 for each cushion.

4.2.3 Mechanical properties

4.2.3.1 Abrasion

When tested in accordance with EN ISO 12947-1 and EN ISO 12947-2, the fabrics for sleeping bags shall withstand at least 20 000 test cycles.

4.2.3.2 Tear strength

When tested in accordance with EN ISO 13937-1, the tear strength of lining and shell fabrics shall be a minimum of 10 N.

4.2.3.3 Colour fastness

a) When testing the colour fastness to rubbing according to EN ISO 105-X12 wet and dry, the requirement for staining shall be a minimum of 3-4.

b) When testing the colour fastness to washing according to EN ISO 105-C06 at care label temperature, the requirements for staining and change of colour shall be a minimum of 4.

c) When testing the colour fastness to perspiration according to EN ISO 105-E04, the requirement for staining and change of colour shall be a minimum of 3-4.

d) When testing the colour fastness to light according to EN ISO 105-B02, the requirement for change of colour shall be a minimum of 4-5.

4.3 Filling material

4.3.1 Feather and/or down

4.3.1.1 Composition

The composition of the filling material shall be determined in accordance with EN 12934.

4.3.1.2 Hygienic state

The filling material shall conform to the requirements according to EN 12935.

4.3.1.3 Filling power

The filling power shall be tested in accordance with EN 12130.

The filling power shall not deviate by more than ± 5 % from the declared nominal value.

4.3.1.4 Filling material mass

The filling material mass, in g, shall be measured according to EN 13088.

The filling material mass shall not deviate by more than ± 7 % from the declared nominal value.

4.3.2 Filling material other than feather and/or down

4.3.2.1 Mass per unit area

The mass per unit area, in g/m², shall be measured according to EN 29073-1.

The mass per unit area shall not deviate by more than ± 7 % from the declared nominal value.

4.4 Finished articles

4.4.1 Water vapour permeability index

When tested in accordance with ISO 11092, the material specific water vapour permeability index (i_{mt}) of the sleeping bag shall be a minimum of 0,45. Where front and back area of the sleeping bag are of different material combinations, both parts shall be tested.

4.4.2 Inside dimensions

4.4.2.1 Inside length

To enable labelling of the sleeping bag, the inside length of the sleeping bag shall be measured within ± 3 cm. The measurement is made by turning the sleeping bag inside out and measuring the length from the position of the seam where the heel of the foot is placed to the top of the sleeping bag (excluding any vertical components of the hood), without applying any force to extend the sleeping bag length.

4.4.2.2 Maximum inside width

To enable labelling of the sleeping bag, the maximum inside width shall be measured within ± 2 cm. The measurement is made by turning the sleeping bag inside out and measuring the circumference at the widest point without stretching the fabric. If the maximum inside width of the sleeping bag is not in the chest area, then the position of the widest point of the sleeping bag shall be indicated on the label. The circumference is halved to provide the width of the sleeping bag. If the sleeping bag has elastic seams, a force of (10 ± 1) N may be used to extend these seams prior to measurement, for instance by using a spring balance.

4.4.2.3 Inside foot width

To enable labelling of the sleeping bag, the foot width shall be measured within ± 2 cm. The measurement is made by turning the sleeping bag inside out and measuring the circumference at a distance (30 ± 1) cm towards the hood from the position where the heel of the foot is placed. The circumference is halved to provide the width of the sleeping bag. If the sleeping bag has elastic seams, a force of (10 ± 1) N may be used to extend these seams prior to measurement, for instance by using a spring balance.

4.4.3 Total mass

The total mass of sleeping bags filled with feather and/or down shall be determined in accordance with EN 13088.

For sleeping bags filled with materials other than feather and down, samples shall be conditioned according to EN ISO 139 and the mass of the sleeping bag (without stuff sack) shall be determined. The total mass shall not deviate by more than ± 7 % from the declared nominal value.

4.4.4 Volume under load

The volume of the sleeping bag shall be determined according to EN 13538-3.

The volume shall not deviate by more than ± 5 % from the declared nominal value.

4.4.5 Thermal properties

4.4.5.1 Principle

The thermal resistance of the sleeping bag is measured with a thermal manikin which meets the requirements and test procedure of EN ISO 15831 and which is inserted into the sleeping bag and placed in a controlled atmosphere.

A physiological model is then applied which uses this thermal resistance to determine ambient temperatures corresponding to a range of utility of the sleeping bag.

4.4.5.2 Thermal resistance

4.4.5.2.1 Thermal resistance posture 1 ($R_c(1)$)

The thermal resistance posture 1 ($R_c(1)$) is measured with the manikin completely inserted into the sleeping bag and lying on its back. The bag's zippers, if any, are closed. The bag's hood, if present, covers the manikin's head, and the cords of the hood are tightened as much as possible without using any additional aids (e.g. clothes pins, etc.) not supplied with the sleeping bag.

For sleeping bags that have hood draw cords with which the hood aperture can be closed to less than 120 mm diameter or 375 mm perimeter, a cold protective mask[1)] shall be used on the manikin's face. For sleeping bags with hood draw cords with which the hood aperture cannot be closed to less than 120 mm diameter or 375 mm perimeter, a cold protective mask shall not be used on the manikin's face. For sleeping bags that do not have a hood or do not have hood draw cords, a cold protective mask shall not be used.

$R_c(1)$ is determined using either the serial or the parallel calculation method according to EN ISO 15831. A combination of these two calculation methods is also possible. With a given manikin, the decision as to which

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1) MIL-M-43294 C (Mask, extreme cold weather; olive green 207) and MK 5507 are the trade names of a product supplied by Colemans and Impuls. This Information is given for the convenience of users of this European Standard and does not constitute an endorsement by CEN of the products named. Equivalent products may be used if they can be shown to lead to the same results.

calculation model is appropriate shall be based on the results of the calibration procedure including the correlation for the individual thermal manikin, as described in 4.4.5.9.

4.4.5.2.2 Thermal resistance posture 2 ($R_c(2)$)

The thermal resistance posture 2 ($R_c(2)$) is measured with the manikin only partly inserted into the sleeping bag, and lying on its back. The upper part of the sleeping bag is pulled up only to the manikin's arm pits; and the arms of the manikin lie on top of the bag's upper part. The zippers of the sleeping bag, if any, are completely opened. The bag's hood, if present, is placed below the manikin's head without tightening the cords. No cold-protective mask is on the manikin's face.

$R_c(2)$ is determined using the parallel calculation method according to EN ISO 15831.

4.4.5.3 Thermal manikin

Specifications of existing thermal manikins vary widely, and they all imply somewhat specific operation conditions. Therefore, in this European Standard, the requirements on the manikin and operation conditions are left open as far as possible, and a calibration procedure (see 4.4.5.9) shall be carried out in order to achieve comparability of the test results of different test houses.

The manikin shall fulfil the following requirements:

— body height between 1,5 m and 1,9 m with a surface area between 1,5 m^2 and 2,1 m^2;

— internal heating with controlled and measurable heat flux (either single global internal heater, single global surface heater or different independent surface heaters);

— at least one temperature measurement of the manikin (either global internal temperature or mean surface temperature);

— regulation to a constant value of either heat flux or surface temperatures so that the measurement can be operated in steady-state condition.

During the test, the manikin shall be dressed with the following garments:

— two-piece suit (upper part with long sleeves, trousers) with a material specific thermal resistance R_{ct} = (0,040 m² K/W to 0,060 m² K/W) tested in accordance with ISO 11092;

— knee-length socks with a material specific thermal resistance R_{ct} = (0,040 m² K/W to 0,060 m² K/W) tested in accordance with ISO 11092.

4.4.5.4 Artificial ground

The test shall be operated with the manikin lying on a mattress with a material specific thermal resistance (R_{ct}) of 0,85 m^2 K/W ± 7 % when tested in accordance with ISO 11092 and placed on an artificial ground. This ground shall consist of a rigid support (e.g. a wooden board large enough that no part of the manikin or the sleeping bag protrudes over the board) with a thickness of 12 mm to 30 mm.

The artificial ground is held above the floor by some kind of support which allows air circulation underneath the artificial ground.

4.4.5.5 Climatic room

The test is operated in a climatic room in which the air temperature shall not fluctuate by more than ± 0,5 °C. The air temperature is set to a value which guarantees that the temperature gradient between the manikin's surface and air is larger than 15 K.

The difference between the air temperature and the radiative temperature of the walls shall be less than 2 K.