DRAFT INTERNATIONAL STANDARD

ISO/DIS 23537-1

ISO/TC **83**	Secretariat: **DIN**
Voting begins on:	Voting terminates on:
2015-10-22	2016-01-22

Requirements for sleeping bags —

Part 1:
Thermal and dimensional requirements

Exigences pour les sacs de couchage

ICS: 97.200.30

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the European Committee for Standardization (CEN), and processed under the **CEN lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Reference number
ISO/DIS 23537-1:2015(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 83 "Sports and other recreational facilities and equipment", the secretariat of which is held by DIN, Germany.

ISO 23537 consists of the following parts under the general title *Requirements for sleeping bags*:

— *Part 1: Thermal and dimensional requirements*

— *Part 2: Fabric and material properties*

Introduction

This International 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 International 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 International 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.

Requirements for sleeping bags — Part 1: Thermal and dimensional requirements

1 Scope

This International 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 International 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 International 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.

NOTE Sleeping bags without homogeneous fillings designed to provide local extra insulation in certain parts pose issues with the calibration and/or test procedure. Ongoing work continues to provide suitable means of establishing temperature ratings.

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*

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

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

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

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

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

ISO 3758, *Textiles — Care labelling code using symbols*

ISO 1096, *Plywood — Classification*

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

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

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

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

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

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 International 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 is possible

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

Note 1 to entry: 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 ISO 139, the default conditions of 20 °C air temperature and 65 % relative air humidity shall be used.

4.2 Finished articles

4.2.1 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 minimum 0,45. Where front and back area of the sleeping bag are of different material combinations, both parts shall be tested.

NOTE 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.

4.2.2 Inside dimensions

4.2.2.1 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.

4.2.2.2 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.

4.2.2.3 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.

4.2.3 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 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.

4.2.4 Thermal properties

4.2.4.1 Principle

The thermal resistance of the sleeping bag is measured with a thermal manikin which meets the requirements and test procedure of 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.

4.2.4.2 Thermal resistance

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

The thermal resistance posture 1 ($R_c(1)$) is measured with the thermal 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 ISO 15831. A combination of these two calculation methods is also possible. With a given thermal manikin, the decision as to which 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 4.2.4.9.

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

The thermal resistance posture 2 ($R_c(2)$) is measured with the thermal 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 thermal manikin's arm pits; and the arms of the thermal 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 thermal manikin's head without tightening the cords. No cold-protective mask is on the thermal manikin's face.

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

4.2.4.3 Thermal manikin

A thermal manikin according to ISO 15831 with the body height of (1,70 ± 0,15) m shall be used.

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 m^2K/W to 0,060 m^2K/W) tested in accordance with ISO 11092;

— knee-length socks with a material specific thermal resistance R_{ct} = (0,040 m^2K/W to 0,060 m^2K/W) tested in accordance with ISO 11092.

4.2.4.4 Artificial ground

The test shall be operated with the thermal manikin lying on a foam mattress with a material specific thermal resistance (R_{ct}) of (0,85 ± 0,06) m^2K/W when tested in accordance with ISO 11092 and placed on an artificial ground. This ground shall consist of a wooden board according to ISO 1096, large enough that no part of the manikin or the sleeping bag protrudes over the board, with a thickness of (20 ± 2) mm.

The artificial ground is held at least 100 mm above the floor by some kind of support which allows air circulation underneath the artificial ground.

4.2.4.5 Climatic room

The test shall be performed in a climatic room with an air speed of (0,3 ± 0,15) m/s, an ambient temperature of (15 ± 2) °C and a relative humidity of (50 ± 5) %. During the test, the ambient temperature shall not fluctuate by more than ± 0,5 °C. The ambient temperature shall be at least 12 K below the thermal manikin's skin temperature. The heat flux shall be at least 20 W/m^2 at each segment of the thermal manikin.

---

1) Mask, Extreme Cold Weather, U.S. G.I., is the trade name of a product supplied by Colemans. This Information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the products named. Equivalent products may be used if they can be shown to lead to the same results.